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Operational Information System Plus (OIS+) Evaluation Report

FINAL REPORT
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NOTICE

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16. Abstract (MAXIMUM 200 WORDS)

Successful performance of the missions assigned to Coast Guard Groups and Stations requires conducting a wide variety of operations. These operations must be supported with an effective Operational Information Process (OIP) for collecting, analyzing, and disseminating time-sensitive operational information and for providing effective command direction for ongoing operations. The Coast Guard recognizes that advances within the computer industry must be employed to improve the OIP.

The current OIP links operational personnel to the required information resources through a combination of voice and written communications. While the process is predominantly manual from the perspective of on-scene personnel, it is fairly robust and reliable through a wide range of environmental extremes affecting ship-to-shore communications.

OIS+ is an extensible prototype information system that will serve as the basis for deploying OIP improvements. As implemented in this task, it incorporates functionality necessary to assist operational personnel involved in vessel boardings and sightings. While the production version of OIS is intended to entail all Coast Guard mission areas, not only law enforcement, the functionality of this prototype was limited to the law enforcement mission to enable it to be developed within the time and budget provided. The system has been designed so that other missions can be added in a modular fashion.

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Executive Summary

Successful performance of Coast Guard operational missions requires conducting a wide variety of activities that must be supported with an effective process for collecting, analyzing, and disseminating time-sensitive operational information. The existing operational information process (OIP) is ineffective. It relies on various out-of-date and poorly coordinated systems for information exchange that combine use of face-to-face communications, voice transmission via radio and telephone, written reports and documentation, electronic and hard-copy data bases, and manual charting systems.

The Coast Guard Research and Development Center (R&DC) has conducted two proof-of-concept projects since the early 1990s: Operational Information System (OIS) Phase I and Phase II. Those research and development efforts resulted in the development of both a Mission Need Statement (MNS) and a two-part Mission Analysis Report (MAR), sponsored by the Office of Command and Control Architecture (G-OCC). The MAR Part II proposes an OIS designed to address the current OIP problem areas identified in MAR Part I.

As recommended in the OIP MAR Part II, OIS+ has been developed using browser technology. The WEB browser is used throughout to standardize the user interface and reduce development costs. Upon interactive query, OIS+ provides the operator with a target vessel's most recent sighting and boarding history. OIS+ reduces redundant data entry efforts through one time data capture of sighting and boarding information. This information is automatically distributed to legacy Coast Guard data bases as well as being posted on a geographic display. Communications with the mobile operational platforms is being provided with cellular modems. The prototype was tested within the Group Boston and the Group Portland Areas of Responsibility (AOR).

While the production version of OIS is intended to entail all Coast Guard mission areas, the functionality of this prototype has been limited to the law enforcement mission to enable it to be developed within the time and budget provided. The system has been designed so that other missions can be added in a modular fashion. Once successfully implemented, this structure could be expanded in scope to include other missions, reports, decision-support software, and executive information systems.

The findings of this prototype support the recommendations of the USCG C^4I Objective Architecture and Transition Plan (ref. 1) and are consistent with the findings of the R&D OIS Phase I & II proof-of-concept projects (refs. 2 & 3). Specifically, those findings are that an OIS is needed and will work to:

- reduce redundant data entry,
- improve command and control and
- provide the right information to the right people at the right time.

The two biggest lessons learned are that (1) the back end data systems necessary to supply real-time operational data to a front-end user system like OIS+ are not available and (2) the communications infrastructure for fast, reliable, and convenient data communication with CG mobile assets is also not available. The good news is that the Coast Guard currently has projects underway to correct both of these problems. The back end data system problem, at least for the

LE mission, should be taken care of when the major portions of MISLE come on line. RCP 99-300 and R&DC project 9250.7 are working together to address the mobile communications infrastructure problem. It is important to note that Coast Guard-wide OIS should not be implemented until these major improvements are completed. Any attempt to do so otherwise will either duplicate these efforts; result in an application which the users want but which the Coast Guard IT can not yet support; or both.

Regardless of how well the communications path is engineered, there are bound to be times when it fails. Once an OIS is operationally fielded, the operators will become accustomed to having it available to assist in the performance of the mission. A minimal set of critical functionality needs to be identified as the OIS is initially designed and then enhanced. The system needs to be designed to provide the operator with this minimal functionality regardless of the presence of a communications path. This <u>offline functionality needs to be part of the primary design consideration</u> and not considered as an afterthought.

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1 System Purpose

OIS+ is an extensible information system prototype that will serve as the basis for deploying OIP improvements. As currently implemented, it incorporates functionality necessary to assist operational personnel involved in vessel sightings and boardings. While the production version of OIS is intended to entail all Coast Guard mission areas, the functionality of this prototype has been limited to the law enforcement mission to enable it to be developed within the time and budget provided. The system has been designed so that other Coast Guard missions can be added in a modular fashion.

2 Background

Successful performance of the missions assigned to Coast Guard Groups and Stations requires conducting a wide variety of operations. These operations must be supported with an effective Operational Information Process (OIP) for collecting, analyzing, and disseminating time-sensitive operational information and for providing effective command direction for ongoing operations. The Coast Guard recognizes that advances within the computer industry must be employed to improve the OIP.

The current OIP links operational personnel to the required information resources through a combination of voice and written communications. While the process is predominantly manual from the perspective of on-scene personnel, it is fairly robust and reliable through a wide range of environmental extremes affecting ship-to-shore communications. Each of the required functions identified is currently accomplished in the following manner:

1. Retrieve vessel information by relaying characteristics to the station watchstander for shoreside evaluation.
2. Retrieve lookout lists (vessels and/or persons on board) either onboard using hardcopy report or by station watchstander.
3. Retrieve prior vessel boarding information on shore prior to patrol or at patrol completion.
4. Record encounter results using hardcopy CG4100 form.
5. Report resulting information to appropriate activities at completion of patrol, by entering information into shore-based facilities and by forwarding the hardcopy CG4100 form.

The Coast Guard Research and Development Center (R&DC) has conducted two proof-of-concept projects since the early 1990s: Operational Information System (OIS) Phase I and Phase II. That research and development effort resulted in the development of both a Mission Need Statement (MNS) and a two-part Mission Analysis Report (MAR), sponsored by the Office of Command and Control Architecture (G-OCC).

The OIS MAR Part I discusses prior analyses, which have identified seven problem areas that seriously affect the efficiency and effectiveness of the current OIP. These are:

- Redundant data entry
- Information not available to field personnel
- Inadequate communications
- Inadequate resource picture
- Cumbersome tasking process
- Poor systems integration
- Multiple security deficiencies

The OIS MAR Part I analyses also indicate that the introduction of a new OIS that addresses the current OIP problem areas is required to achieve any significant improvements in mission effectiveness. No alternatives were found that would address gaps in the existing OIP without first implementing significant changes to the way operational information is now gathered, transmitted, analyzed, archived, and displayed.

OIS MAR Part II describes a proposed OIS designed to address the problem areas identified above. The objective is to build a prototype OIS that will serve as a basic structure. Once successfully implemented, this structure could be expanded in scope to include other missions, reports, decision-support software, and executive information systems. This report addresses the prototype development (to be known as OIS+) recommended in OIS MAR Part II.

3 System Scope

As recommended in OIS MAR Part II, OIS+ has been developed using browser technology. The Web browser is used throughout to standardize user interface and to reduce development costs. Communications with the mobile operational platforms is provided with cellular phone. The prototype was first be tested within Group Boston and Group Portland Areas of Responsibility (AOR). The prototype system includes the following functions:

- Data Recovery:
  1. Retrieve target vessel description information based upon a query of the vessel's documentation or state registration number.
  2. Automatically check the latest lookout list for the target vessel's name or number.
  3. Retrieve the most recent sighting and boarding information from LEIS II.
- Data Entry:
  4. One time data capture of sightings with minimal data entry requirements.
  5. One time data capture of boardings with minimal data entry requirements.
  6. Print out a prefilled Boarding Report (CG4100 Report) using information retrieved from the web server.
- Data Storage:
  7. Automatically enter completed sightings and boardings into LEIS II.
  8. Automatically enter boardings into the CG4100 Processing Center data base.
- Data Display
  9. Display Coast Guard mobile resources on an Operation Center's Coast Guard Common Operating Picture (CG COP).
  10. Display sighted and boarded vessels on an Operation Center's Coast Guard Common Operating Picture (CG COP).

4 Prototype Description

4.1 System Overview

OIS+ is a prototype data base application that can be accessed by operational Coast Guard personnel using Web browser technology. The data base application has been developed to record information from vessel boardings and sightings and to provide data in response to queries requesting recorded information about vessels in the data base. Web browser technology was employed to ensure compatibility with the CGSW III architecture. OIS+ built upon lessons learned in the Operational Web Link (OWL) project, which also utilized Web browser technology. Specific information processes employed during sightings and boardings and incorporated in OIS+ include:

1. Query vessel information to identify sighted vessels.
2. Query lookout lists to determine the interest in engaging the vessel.

3. Query prior vessel boarding information to identify relative risks associated with engagement.
4. Record encounter results.
5. Report resulting information to appropriate activities.

Once successfully demonstrated, OIS+ could continue to be expanded to include other missions, reports, decision support aids, and other information systems.

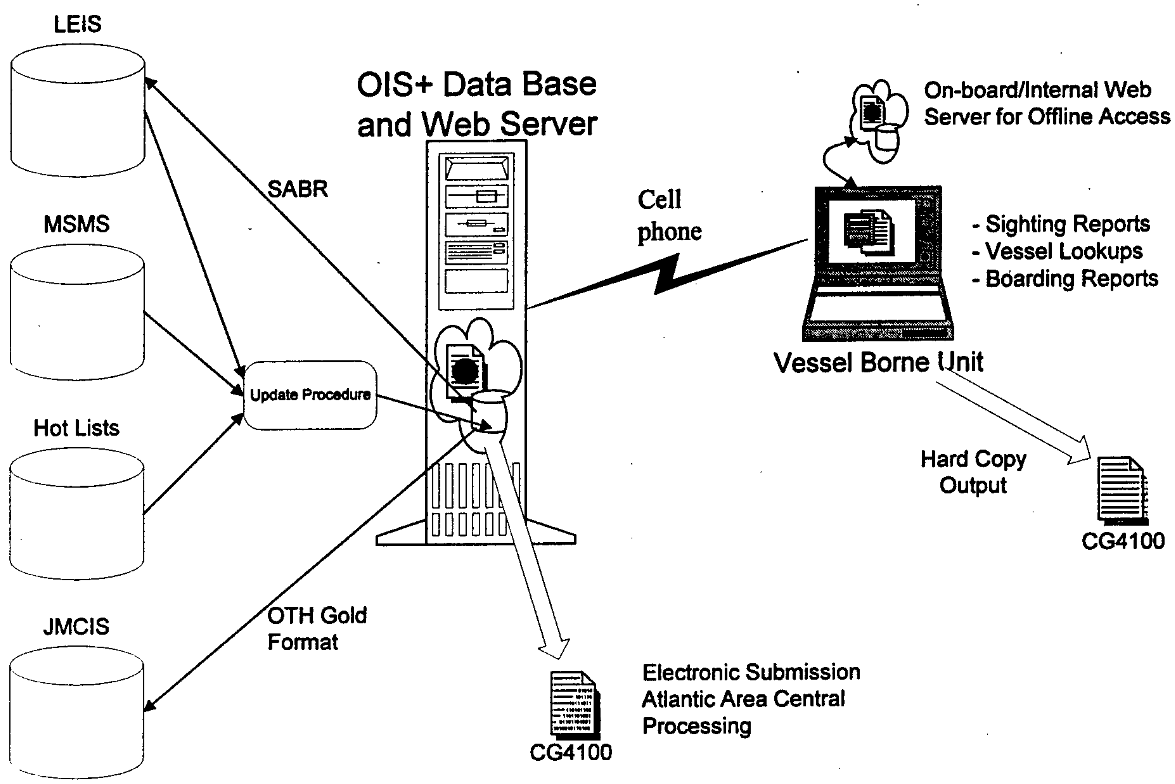

Figure 1: OIS+ Operational Concept

4.2 System Description

The OIS MAR discusses problem areas relative to the efficiency and effectiveness of the current OIP in Part I and proposes an OIS that addresses these problem areas in Part II. As proposed, OIS+ incorporates browser technology to accomplish the required functions and improve the accuracy and timeliness of information exchange. Figure 1: OIS+ Operational Concept shows the overall concept employed by OIS+ to support operational information needs during vessel boardings and sightings. The concept employs a central data base and Web server, which serve as an interface between existing Coast Guard data resources and vessel-borne workstations using Web browser software.

With OIS+, operational personnel are linked to the required information resources electronically, via the OIS+ data base and Web server. Each of the required functions is to be accomplished in the following manner:

1. Query vessel information by transmitting characteristics to the Web server, which queries the data base and returns matching records for display.
2. Query lookout lists. The Web server automatically includes lookout list information when responding to vessel information queries.
3. Query prior vessel boarding information by selecting the appropriate vessel from the records returned. This requests the Web server to return prior boarding information about the selected vessel for display.
4. Record encounter results by printing a hardcopy boarding report, prefilled with available vessel information, and entering new information obtained.
5. Report resulting information by completing the prefilled boarding report, either while on patrol or at the completion of a patrol. Upon submission, data entered is formatted as required and automatically transmitted to all appropriate activities.

In addition to OIP changes made above, OIS+ also supports or enhances operation in the following areas:

6. Automatically implements the seven-day recreational vessel compliance program by holding electronic submission of CG4100 data to Atlantic Area Central Processing for the appropriate amount of time.
7. Provides free form text transmission from OIS+ equipped operational units to the station watchstander via e-mail.
8. Provides automatic resource tracking to a CG common operating picture (COP).
9. Provides automatic target plotting to a CG COP.
10. Provides a unit activity summary, which displays daily activity reports.
11. Provides for automatic capture of OIS+ effectiveness measures.

4.3 Detailed System Functions

4.3.1 Vessel Information Retrieval.

The crew aboard an OIS equipped CG platform could query the OIS system, via the onboard computer, with the number or name of the target vessel the platform was approaching (Figure 2). The computer would transmit that query via cellular modem back to the OIS central web server.

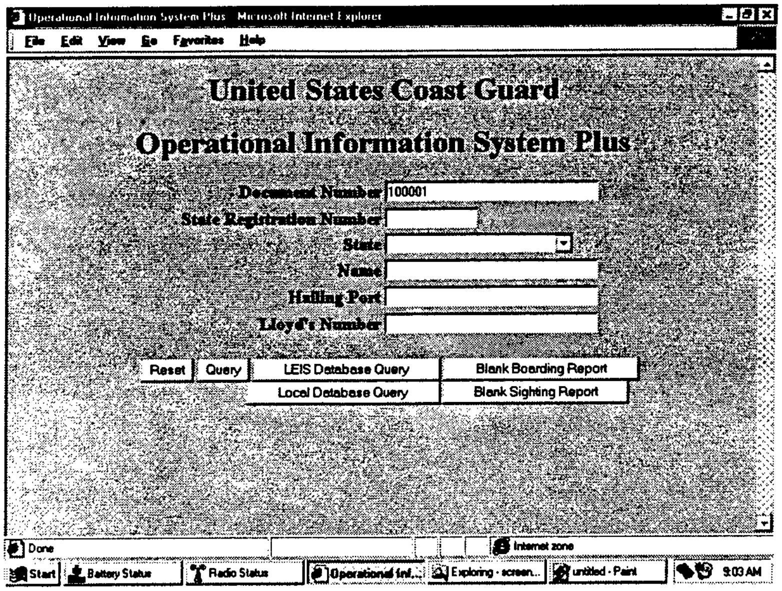

Figure 2: OIS+ Main Query Screen

The web server responds to the query with any available information about the target vessel; specifically, whether or not the vessel is on the lookout list, the date the vessel was most recently sighted, and the date the vessel was most recently boarded. The retrieved information is linked to detailed screens providing additional information regarding the target vessel. The CG operator can choose whether or not to retrieve this additional information from the web server.

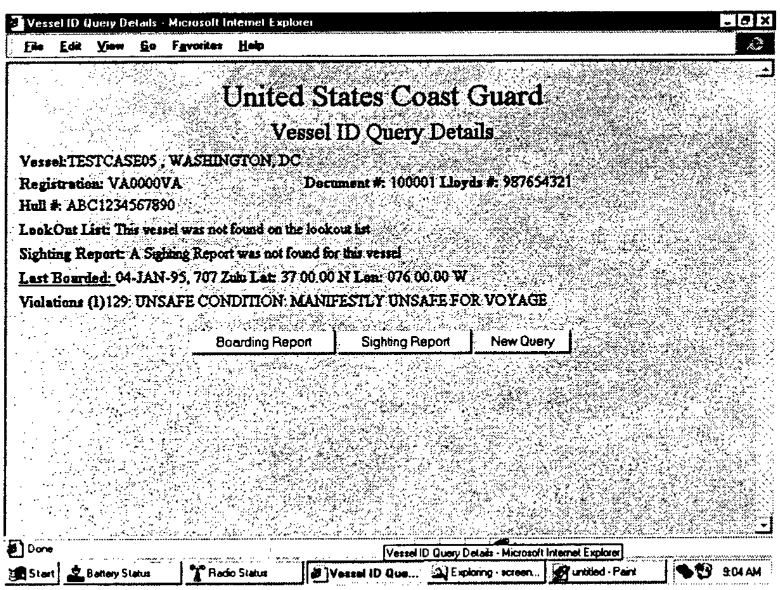

Figure 3: OIS+ Vessel ID Query Details Screen

With this information the crew aboard the CG platform can make an informed decision about whether to board the target vessel or just sight it.

4.3.2 Sighting and Boarding Information Capture.

Depending upon the CG crews decision to sight or board the target vessel they select the appropriate button from the screen above (Figure 3).

4.3.2.1 To sight the vessel the crew completes the Sighting Report screen (Figures 4 & 5) with as much data as possible. The only required data is the Event Group Id, automatically assigned by the computer upon pressing the "Assign ID" button, and a position which can be automatically entered from the platforms GPS unit by pressing the "Obtain LAT/LONG" button. All the other required fields are pre-filled by OIS. Pressing the "Submit" button sends the sighting information to the OIS web server. The operator receives a confirmation back from the server and the sighting is complete. No further action is required from the operator.

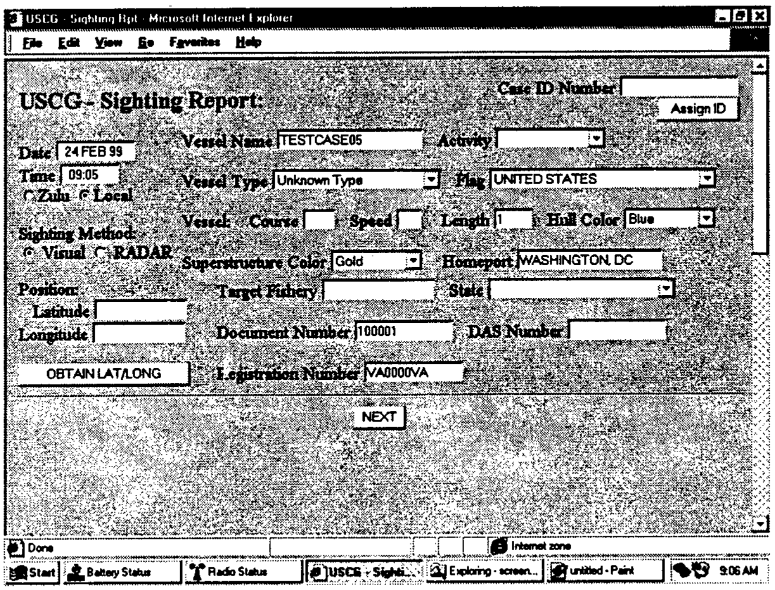

Figure 4: OIS+ Sighting Screen #1

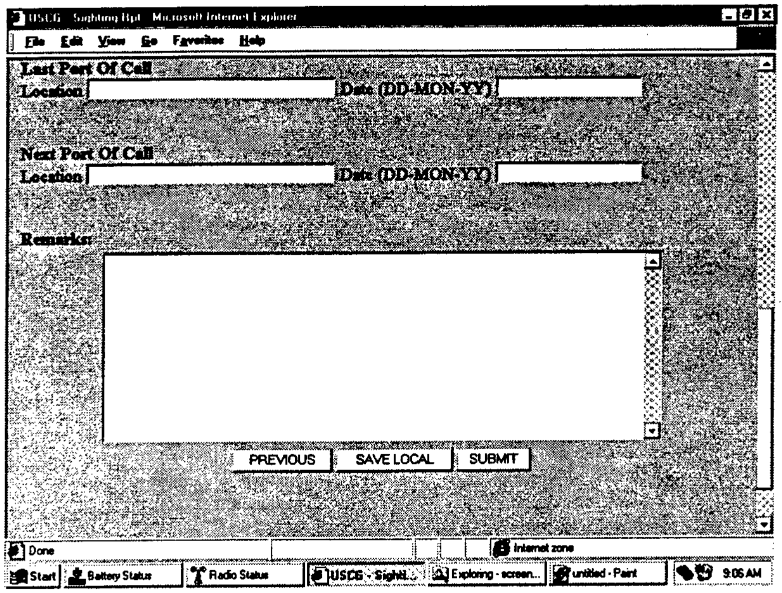

Figure 5: OIS+ Sighting Screen #2

4.3.2.2 To initiate a boarding of the target vessel the crew completes the Boarding Report screen (Figures 6-8). The only required data is the Event Group Id, automatically assigned by the computer upon pressing the "Assign ID" button, and a position which can be automatically entered from the platforms GPS unit by pressing the "Obtain LAT/LONG" button. All the other required fields are pre-filled by OIS. The operator can choose to enter as many or as few of the data fields presented on the screens.

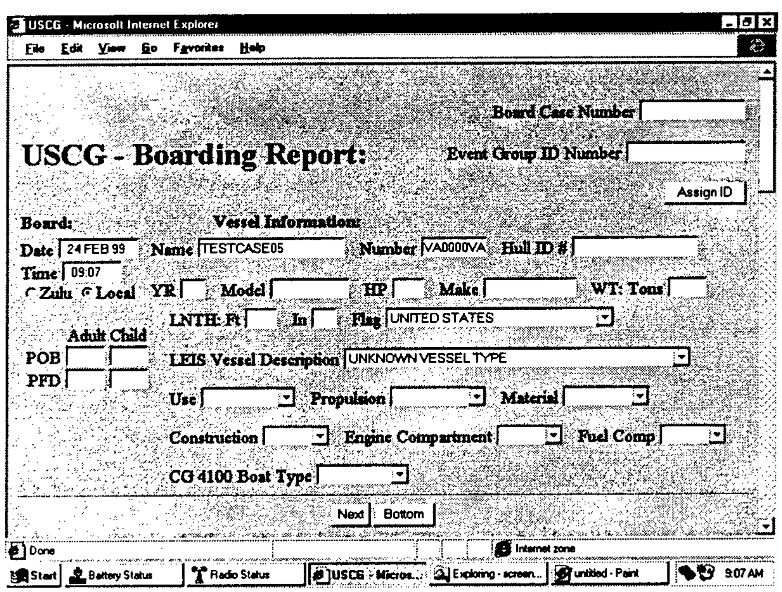

Figure 6: OIS+ Boarding Entry Screen #1

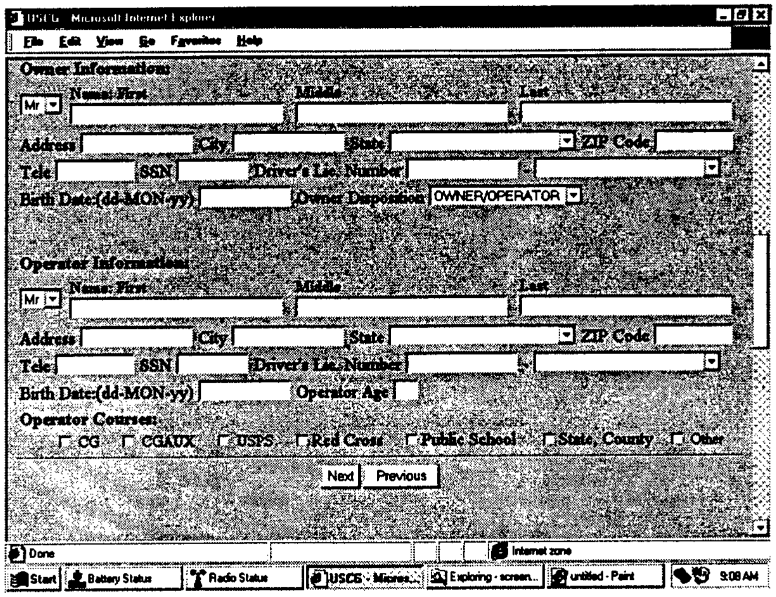

Figure 7: OIS+ Boarding Entry Screen #2

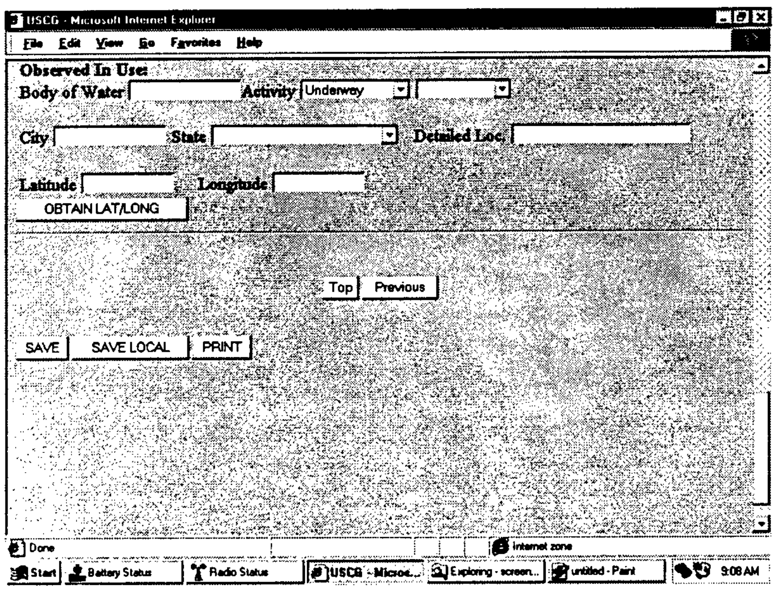

Figure 8: OIS+ Boarding Entry Screen #3

Pressing the "SAVE" button saves the information to the central web server for completion upon return to the station. The "SAVE LOCAL" button saves the boarding information to the local data base stored on the laptop computer. This feature would be used if cellular communications could not be established. The boarding information would need to be uploaded to the central web server when communications are restored. The "PRINT" button saves the boarding information to the local data base stored on the laptop computer to allow the operator to print a prefilled CG4100 Boarding Report.

To print the CG4100 Boarding Report the operator would switch to the OIS Plus Local Data Base (Figure 9) and select the "Print Boarding Report" button.

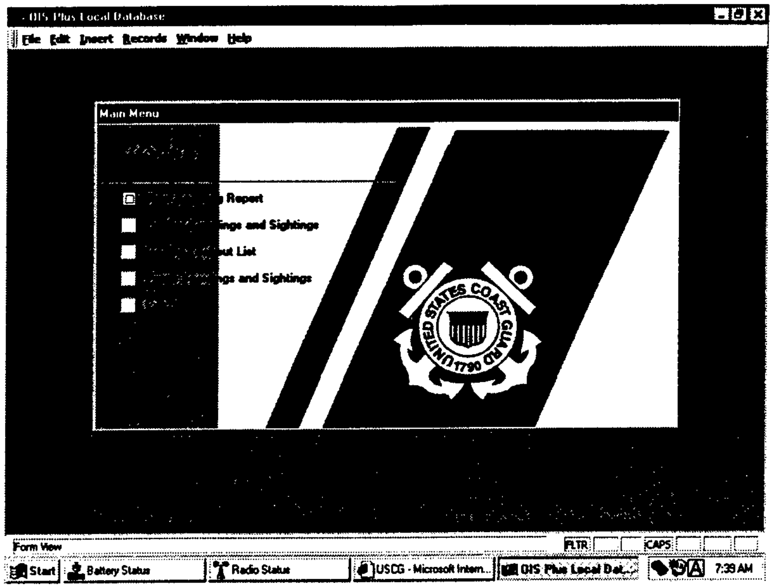

Figure 9: OIS+ Local Data Base Main Screen

The operator selects the appropriate boarding from the pick list (Figure 10) and presses the "Print" button to send the CG4100 Boarding Report to the dot matrix printer installed aboard the small boat. The Boarding Team would then go aboard the vessel and complete the boarding as usual.

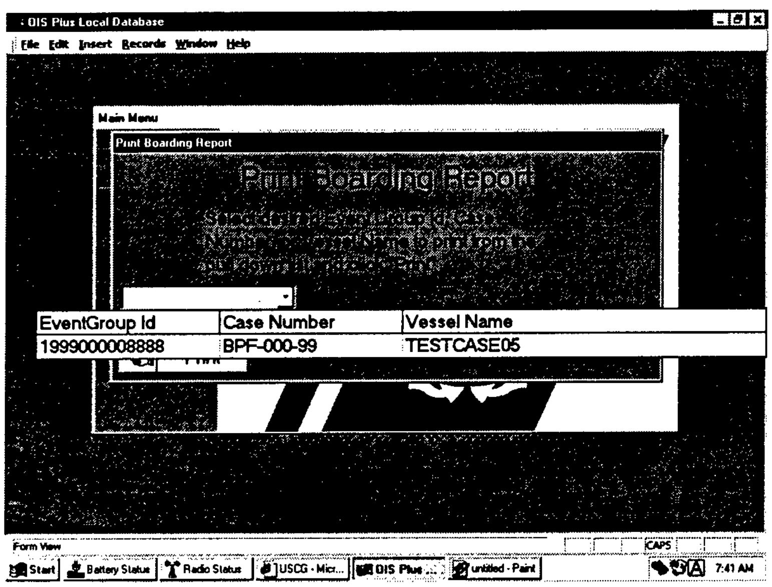

Figure 10: OIS+ Print Boarding Report Screen

4.3.2.3 To complete a Boarding Report upon return to the station the boarding officer uses OIS to enter in any data collected and any citations issued while on board the subject

vessel. This is done by selecting "Complete a Boarding Report" from the OIS Main Screen (Figure 11).

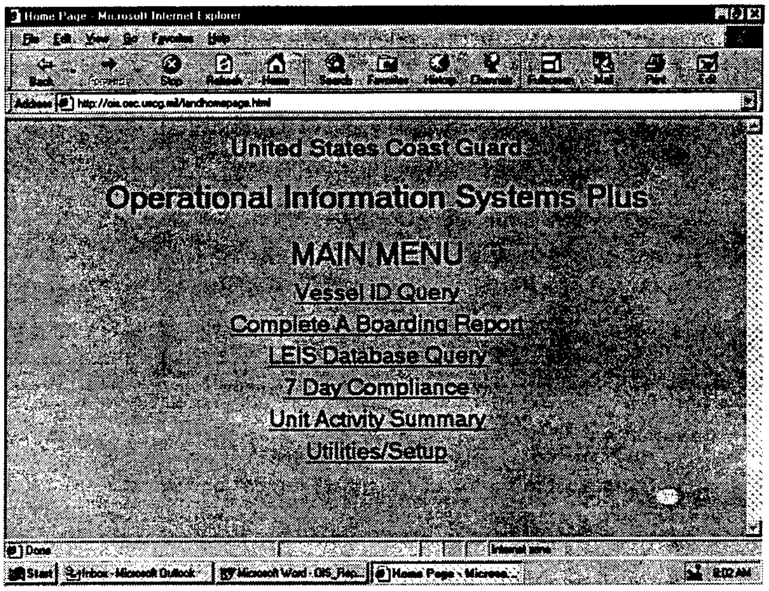

Figure 11: OIS+ Shoreside Main Menu Screen

The operator would select the appropriate boarding and enter all of the accumulated data on the following screens (Figures 12 – 14).

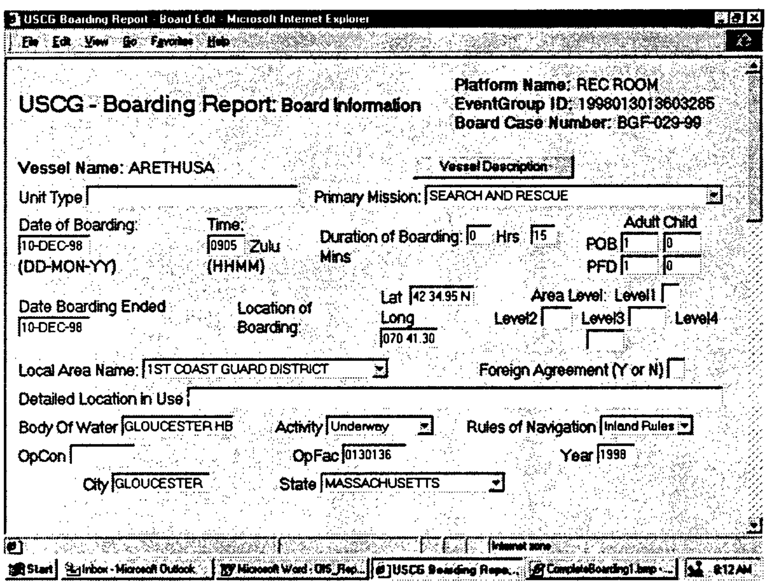

Figure 12: OIS+ Complete a Boarding Report Screen #1

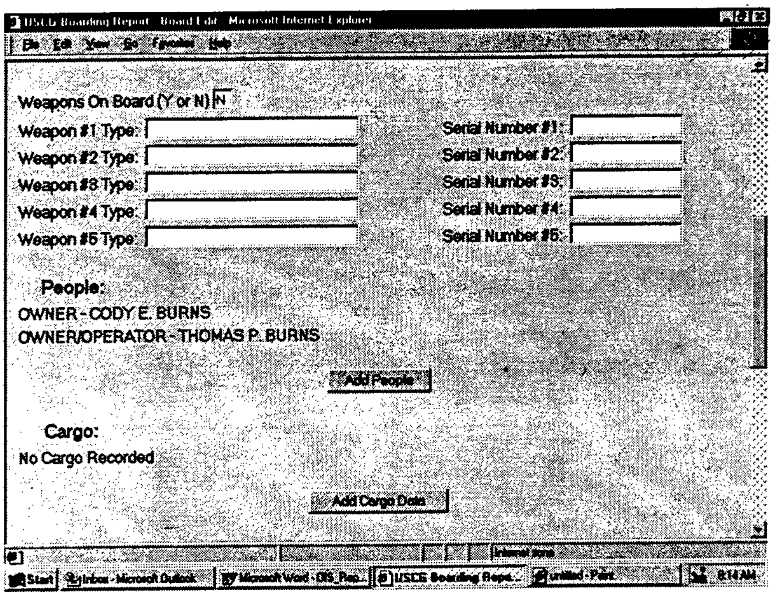

Figure 13: OIS+ Complete a Boarding Report Screen #2

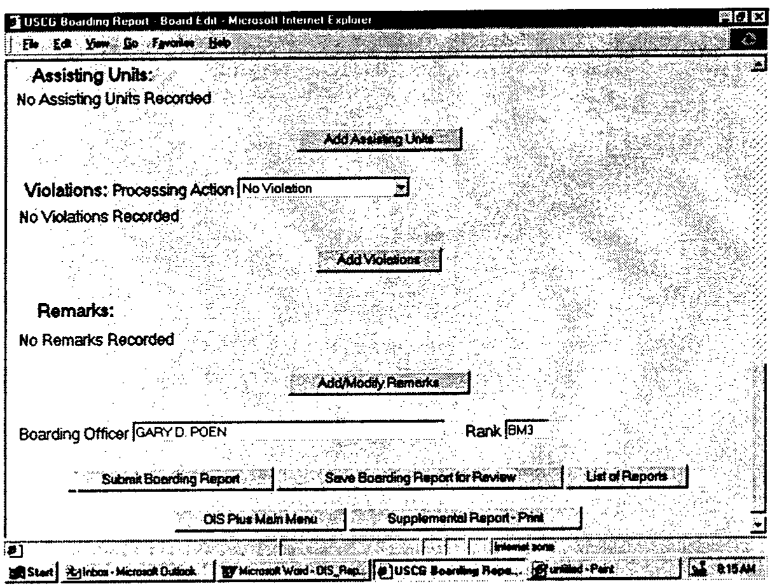

Figure 14: OIS+ Complete a Boarding Report Screen #3

At any time the operator may press the "Save Boarding Report for Review" button. This saves all the data entered to the OIS web server but does not submit the data to LEIS. This allows for the operator to be called away prior to entering all the data, and for a command review prior to submission. Once the boarding report is complete and reviewed by the appropriate station personnel, pressing the "Submit Boarding Report" button signals the OIS web server that this report is ready for submission to LEIS. This boarding report can no longer be edited using OIS Plus.

4.3.3 Automatic LEIS Submission.

4.3.3.1 Once an operator has successfully submitted a sighting or a boarding to OIS+, he or she no longer needs to worry about its submission to LEIS II. On a periodic basis a task is executed on the OIS+ web server that extracts from the OIS+ data base all successfully submitted sightings and boardings since the previous extraction. The task formats each sighting or boarding into a form known as a SABRgram. These are written to a file and formatted in accordance with the LEIS II Interface Specification. In coordination with the LEIS II program, a task is executed on a periodic basis on the LEIS II Central Server, which uses the file transfer protocol (FTP) utilities to move the SABRgrams from the OIS+ server to the LEIS II Central server. Once the SABRgrams are on board the LEIS II Central server they are properly inserted into the LEIS II Central data base.

4.3.3.2 The batch routine that creates the SABRgrams on the OIS+ server and the batch routine on the LEIS II server that moves the files are completely automatic once they are initially scheduled. Currently, each routine is scheduled to run once a day, late in the evening. The frequency of either batch routine could easily be increased, as operations require.

4.3.4 Resource and Target Tracking

4.3.4.1 The Resource Tracking Client is a separate application installed on the 41' utility boat (UTB) laptop computers(Figure 15). This application obtains the UTB's position from the boat's GPS unit, and periodically sends the position report, via the cellular modem, to the Resource and Target Tracking Server application installed on the OIS+ Web server at OSC. Prior to sending the position report, the client application checks to see if a connection with OSC is already established. If there is already a connection, then it uses that connection to send the report. If no connection exists, the client application dials the modem and makes the necessary connection. Once the client has sent the report, it alerts the user that it is going to break the connection unless the user decides to keep the call open. Once both applications are configured and started, no user interaction is required. The Resource and Target Tracking Server application passes the data to the OIS Defense Information Infrastructure Common Operating Environment (DII COE) Server's track data base manger (TDBM) automatically across the OSC local area network (LAN).

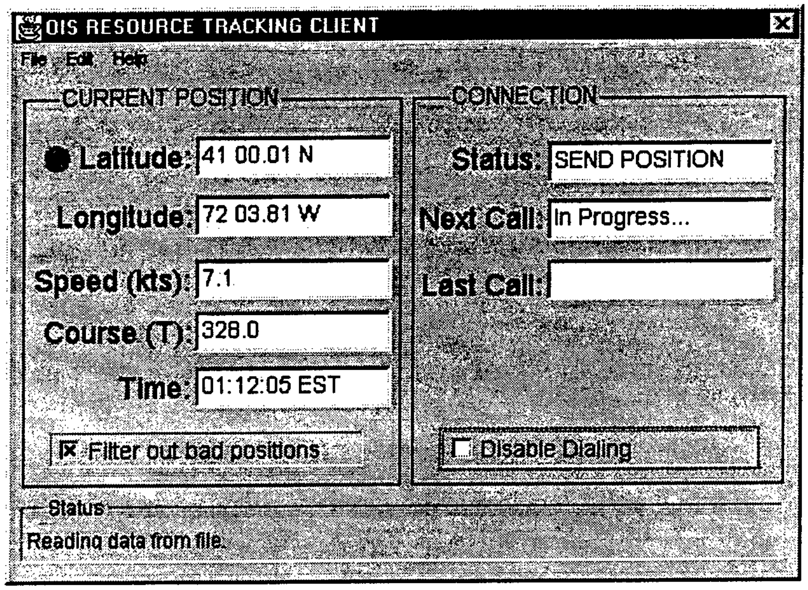

Figure 15: OIS+ Resource Tracking Client Screen

4.3.4.2 Target tracking is accomplished in a similar manner to the resource tracking. The Resource and Target Tracking Server application periodically extracts from the OIS+ web server all newly submitted sightings and boardings. The Resource and Target Tracking Server application then sends those across the OSC LAN to the DII COE server TDBM.

4.3.5 C2PC

The Command & Control Personal Computer (C2PC) 5.1 Chart Client and Gateway provides the capability to display a Nautical Chart with both Coast Guard and target vessel locations displayed. The C2PC Chart Client displays the chart on the Coast Guard standard workstation III (WSIII). The basic chart used by C2PC is World Vector Shoreline (WVS), which shows the interface between land and water. C2PC also allows other charts to be overlaid on top of the WVS. The C2PC Chart Client receives track data through the C2PC Gateway from the DII COE server TDBM when the Trackplot mode is selected and is connected to the C2PC Gateway. The C2PC Gateway communicates with the DII COE server over the CGDN+ or RAS dialup interfaces. As new track information arrives at the DII COE Server it is automatically sent to the C2PC Gateway, which in turn sends it to the connected C2PC Chart Client (Figure 16).

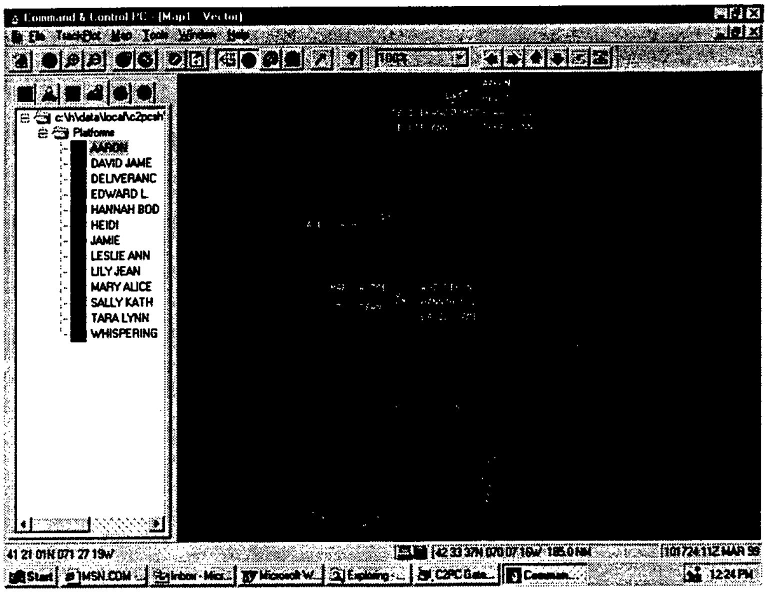

Figure 16: C2PC Tracking Display Screen

4.3.6 Offline Operations Mode.

The OIS+ Local Workstation Data base (Figure 17) implements the offline operations mode for mobile workstations. The operator normally communicates via the workstation Web browser with the central data base. When the central data base is offline (due to communication failures server problems, etc.), the user can still make limited requests and save sightings and boardings to the local data base via a personal Web server installed on the user's workstation. Once connectivity with the OIS+ Central data base is restored, these locally saved sightings and boardings can be uploaded to OIS+ Central for further processing.

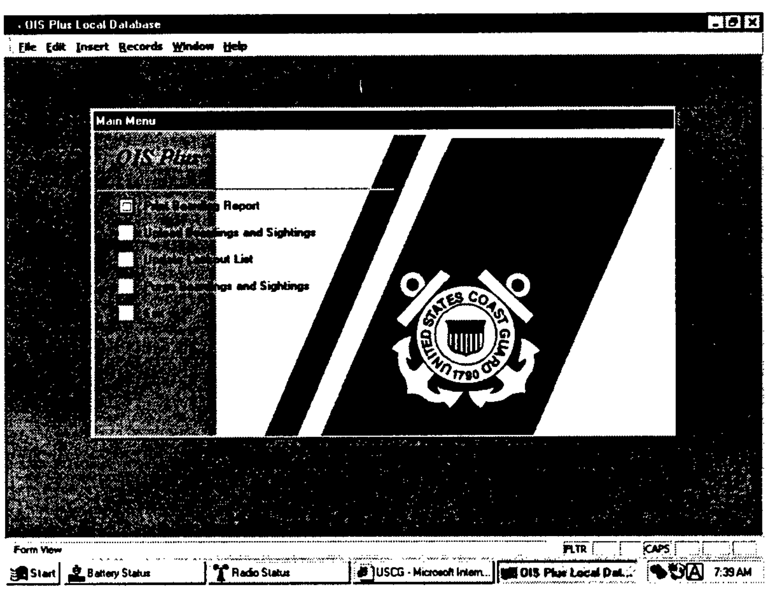

Figure 17: OIS+ Local Data Base Main Screen

The offline operations mode incorporates the following functionality:

- Locally save Sighting Reports and CG-4100 Boarding Reports on the mobile operator's workstation until such time as communications are restored between the mobile operator's workstation and the central OIS+ Web server.
- Print multiple copies of the prefilled CG-4100 Boarding Report on the Utility Boats (UTBs); allowing the Boarding Officer to use the paper copies to perform the boarding.
- Upload saved Sighting and Boarding Reports to the central OIS+ Web server when communications are restored.
- Search an abbreviated lookout data base stored on the mobile operator's local workstation whenever communications between the mobile operator's workstation and the central OIS+ Web server are not available.
- Search an abbreviated vessel information data base stored on the mobile operator's local workstation whenever communications between the mobile operator's workstation and the central OIS+ Web server are not available. <u>This feature was never implemented due to difficulties encountered in developing the OIS+ Central data base. See Section 5 for more discussion on this point.</u>

The OIS+ Local Workstation Data Base also incorporates procedures to update the abbreviated lookout data base stored on the mobile operator's local workstation. These procedures run on an as-needed basis and require minimal operator intervention beyond update initiation.

4.4 Testbed Description

This section describes the prototype test bed as it was implemented. It describes the products used and the justification for using them as well as the various units that participated in the prototype. The testbed consisted of UTBs, small boat stations and Group Operations Centers. The central web server was located at the Coast Guard Operations System Center (OSC). Detailed information regarding the software development can be found in the OIS+ Prototype Development CSDD (ref. 4).

Throughout the planning, development and implementation of the OIS+ prototype, two basic principles guided the hardware selection process 1) utilize Coast Guard established and defacto standards whenever possible and 2) select scalable systems to handle potential future growth.

4.4.1 Mobile Platforms

Due to the short timeframe and limited budget, it was decided to prototype OIS+ only on the 41' UTB's. The three basic components to be installed are 1) a rugged laptop computer running Windows 95, 2) a analog cellular modem and 3) a rugged dot matrix printer. See Appendix 2 for a detailed discussion on the selection and specifications of these three products. The completion of BOATALT 95 was a requirement for OIS+ because it provided the necessary space both within the pilot house and up on the mast for the OIS+ equipment.

Figure 18: OIS+ Computer, mounted on pedestal, aft stbd corner of UTB pilothouse

The OIS+ computer is inserted into a vehicle cradle, which is mounted atop a 36" aluminum pedestal located in the aft starboard corner of the pilot house (Figure 18). The cradle was modified from the manufacturer's design to accept 24 VDC from the UTB, convert it to 12 VDC, and distribute the power to the laptop, the cellular modem and the printer. The cellular modem was mounted on the inside of the crewman's bench. A power cable was run up the pedestal to the vehicle cradle. The antenna for the cellular modem was mounted in the UTB's yardarm installed on the mast with the cable running down the inside of the mast into the pilot house using existing stuffing tubes.

The printer was installed inside the Pyro Locker located on the starboard side of the forward cabin. It was mounted to the face of the existing shelf within the locker (Figure 19). An aluminum paper tray was installed directly below the printer to hold the fan-fold, multi-part carbonless paper. A power cable, and a parallel printer cable was run aft to the vehicle cradle installed in the pilothouse.

The only direct interface with the UTB systems other than the 24 VDC connection into the UTB power panel is a two wire serial connection from the UTB's GPS system into the laptop. This provides the data for OIS+ to prefill the latitude and longitude directly into the web pages.

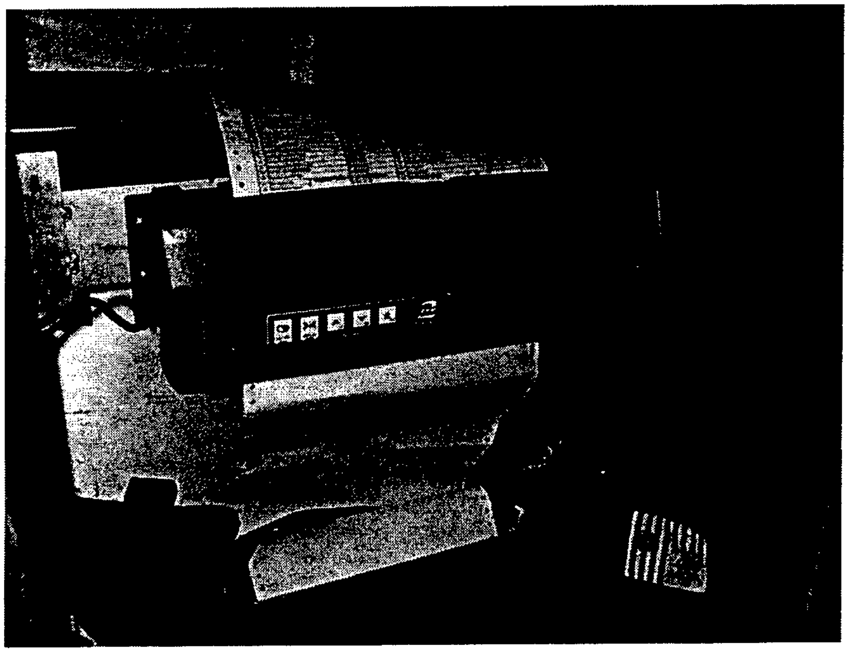

Figure 19: Rugged Printer mounted aboard UTB

4.4.2 Shore Units

This prototype equipped five (5) Coast Guard Stations, two (2) Station (smalls) and two (2) Group Offices. Each location received a SWIII Multimedia computer, with identical hardware and software configurations. The only difference among the shore units is how the computer connected to CGDN+, which depended upon whether the unit was migrated to SWIII or not. Computers located at migrated units directly connected to the LAN. Computers located at non-migrated units dialed into the network via modem. Stations received two (2) computers and one (1) printer. Stations (small) and the Group Ops Center received one (1) computer and one (1) printer each.

4.4.2.1 Hardware. Each computer was a SWIII multimedia computer which included a P200MMX processor, 32MB of RAM, a 1.6GB hard drive, a Network Interface Card, and a 17" color monitor.

4.4.2.2 Software. Each SWIII computer was loaded with the standard Coast Guard image with two modifications: (1) the C2PC Client (version 5.1) and Gateway software installed in accordance with ref. 5, and (2) the Dial Up Networking was enabled to allow the operators to dial into the CGDN+ if the station was not yet migrated to SWIII.

4.4.3 Operations System Center (OSC)

OIS+ was designed with capability built in to support growth beyond the two Group prototype. With this in mind, and to gain the benefits and expertise of a professionally run data center, the OIS+ Central Server equipment was located at OSC, Martinsburg, WV. As illustrated in Figure 20, three major OIS components were installed at OSC: the web server, the DII COE server and a modem bank.

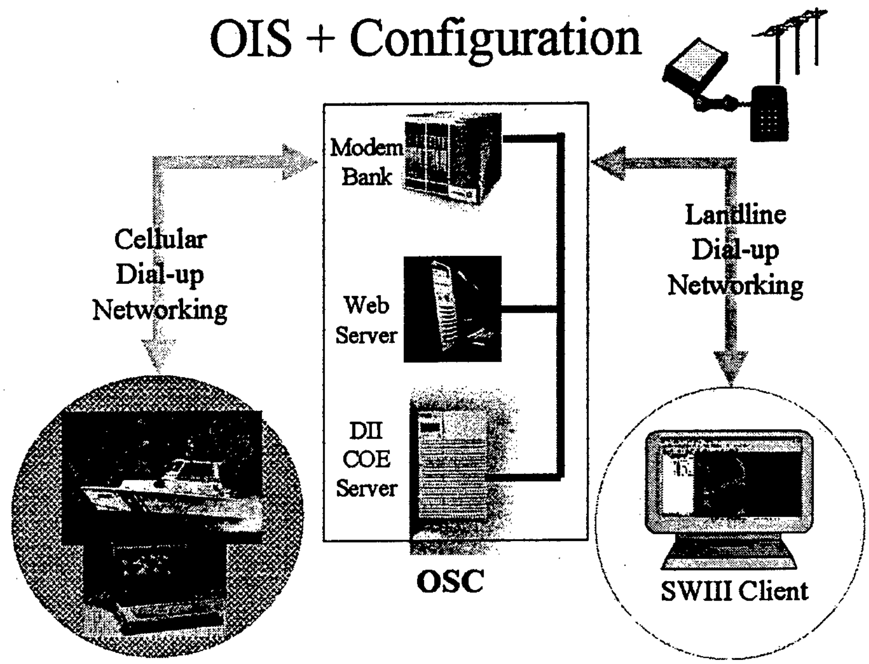

Figure 20: OIS+ Conceptual Configuration

4.4.3.1 OIS+ Web Server

The OIS+ Web Server is a rack mounted, dual Pentium Pro 200MHz, NT computer with a 4GB RAID array disk drive system, manufactured by CSS Laboratories. This hardware was chosen to be compatible with all the other NT servers being operated at OSC. The application software consists of three major components: a relational data base schema, application packages, and static Web pages. Together these components provide information processing, interactions, and application usage between the data base and various end users. The schema and application packages have been written to the standards and requirements of Oracle 7 Server™ version 7.3.2.3.1 for Windows NT. Web page design, presentation, and interfacing application packages adhere to the requirements of Oracle® Web Application Server version 3.0.0.18.0 for Windows NT and Microsoft® Internet Information Server version 4.0 for Windows NT. This or later versions of the software are required to make the OIS+ Central Server operational. Detailed information regarding the software design can be found in the OIS+ Prototype Development CSDD (ref. 4).

4.4.3.2 DII COE Server

The DII COE Server is a Hewlett Packard Domain Enterprise/Internet Server, model D350. The D350 is running the standard HP-UNIX operating system. The D350 is running the standard JMCIS UB 3.0.2.X Tactical Data base Manager (Tdbm) as supported by the C2CEN. This is the same Tdbm that is utilized in CIC aboard the WMEC's and WHEC's. The DII COE server runs as a standalone, unclassified, system and as Tdbm Master. This is where the resource and target track information is

stored, and retrieved by the C2PC client. New tracks come into this machine from the OIS+ Web Server.

4.4.3.3 Modem Bank
The modem bank was provided as an access point to the CGDN+ for stations participating in the prototype that have not yet been migrated to SWIII and for the UTB's to gain access to the system via cellular modem while underway. Operators gaining access to the CGDN+ in this fashion were limited to Coast Guard Intranet sites only. The modem bank actually consisted of two different types of modems. The first type, supported the shore based users, were FastBlazer 8820 rack mounted modems connected to a Netblazer hub. These modems were chosen because they were compatible with existing modem banks installed at OSC. The second type of modem, which supported the mobile users, were Paradyne 3825+ rack mounted modems. These too, could be connected to the Netblazer hub. The Paradyne modems were chosen because they supported the ETC error correcting protocol that is used by the Sierra Wireless modems on the UTBs. The ETC protocol was robust enough to maintain a connection during signal fade, or transfers from cell to cell. See section 5.3.2 for a more detailed discussion of the ETC protocol.

4.4.4 Participating Units

This section describes which units participated and how they aided in the success of this prototype. The purpose of this section is not just to give kudos to the units but to emphasis the importance of teamwork to make a project like this come together.

4.4.4.1 OSC. The Information Systems Technology (IST) Division of OSC has been very helpful from the start of this project. Staff members of the IST Division were primarily responsible for identifying, procuring, installing and operating all three hardware components described in section 5.2.3. The LEIS II system administrator with Fuentez Systems Concepts Inc at OSC has been another key player. He was very instrumental in providing LEIS extracts and ensuring that the sightings and boardings were being properly entered into LEIS II from OIS+.

4.4.4.2 ESU Boston. Without the cooperation of ESU Boston, ESD Boston and ESD So. Portland, OIS+ would not have been possible. On top of their already overflowing workload, including SWIII migration, they graciously took on the work of installing and supporting the OIS+ equipment on the UTBs. Not only did this relieve the project from having to find other resources to install and maintain the equipment; it also made life easier for the station personnel because they still had one consistent reporting location for all electronic failures.

4.4.4.3 Groups. Both Group Boston and Group So. Portland have been very supportive of OIS+. The Industrial shops worked to get BOATALT 95 on all the Groups UTBs. They fabricated and modified the computer pedestals in a very timely manner. The Group Operations office was very cooperative and supportive of the change in SOP brought about by OIS+.

4.4.4.4 Stations. All five stations (Point Allerton, Gloucester, Portsmouth Harbor, So. Portland and Boothbay Harbor) and both Stations (small) (Scituate and Merrimack River), are commended for their participation and cooperation with this prototype. They endured change, additional training, and the trials of a rapid prototype system only to have the system removed from them just as the bugs were being worked out and it started to become a comfortable part of the standard operating procedure (SOP).

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5 Benefits/Results

The information used to formulate this section has been captured in a variety of ways. Two user workshops were conducted during the course of the project. The first workshop was conducted at the beginning of the project to validate user requirements. The second workshop was conducted near the end of the project to capture user feedback. Both of the workshops were facilitated, and were attended by representatives from the District, both Groups and all Stations.

The users also had the opportunity to provide formal feedback via the Qualitative Assessment Forms. These were one-page forms that helped the user focus his/her thoughts and provided an area to express those thoughts in writing. A copy of the Qualitative Assessment Form is attached as Appendix 3. These forms were distributed at three different times starting in January 1999.

A third, less formal, method for users to express their feelings towards OIS+ was through the use of electronic mail. This was their primary means of communicating with the development team. An email capability was built into OIS+ so the users could send the e-mails from any OIS+ workstation, whether ashore or afloat. The users were encouraged to send an email any time they had questions regarding the use of OIS+ or any time they experienced a problem or bug while using OIS+. Both the project manager and the system developer received these e-mails.

5.1 Benefits of OIS+

5.1.1 Rapid data retrieval.

The most useful feature of OIS+ was the ability to rapidly retrieve the target vessel boarding and sighting history upon approach of the vessel. Section 12 of the OA&TP (reference 1) documents the user requirement and the shortfall of the current OIP to provide this capability to the operator. It was made very clear during the discussion at the second user workshop as well as in the Qualitative Assessment Forms that this feature was very beneficial. The ability to rapidly retrieve the target vessel boarding and sighting history provided:

- a more professional image for the Coast Guard;
- better information for the UTB to make the board/no board decision; and
- a more secure boarding environment.

5.1.2 One time data capture.

Another very useful feature was the one time data capture of sighting information. OIS+ provided the ability to easily enter sighting information at the time of the sighting. Once the information was submitted, the operator wasn't required to perform any further actions.

Entering sightings directly into OIS+:

- Simplifies the sighting process. It eliminates the need to write down the information on a locally generated form while underway, only to be typed into LEIS II on the SWII computer upon return to the Station.
- Improves data quality in two ways. First, prefilling the sighting screen with vessel description information keeps the data consistent sighting to sighting. Second, only handling the data once significantly reduces the change of data transposition, or mis-interpretation due to unlegible notes.
- Improves timeliness of the data since sightings can be recorded almost immediately.

5.1.3 E-Mail.

A third useful feature of this prototype was the ability to use free format e-mail from the UTB. This feature made up for the lack of availability of other desired features. For example, OIS+ did not provide a link for NCIC checks. However, instead of radioing back to the Station and having to phonetically spell out multiple crewmember names, the operators could type them into an e-mail and verify the correct spellings. Then if the Station or Group happened to receive a lengthy reply from NCIC, they could send the details in an email, which would be easier to understand then trying to relay the same information via voice circuits.

5.2 Problems with OIS+.

5.2.1 Too many data fields.

The OIS+ features identified as the least useful by the operators are all related to the CG4100 Boarding Report processing. As described in Section 4.1, processing a boarding report with OIS+ is a two-fold process. There are a lot of data fields that need to be captured. All of the data fields presented on the screens correspond to required data fields in LEIS II. It was outside the scope of this project to attempt to gather less data. However, it was this requirement that made this feature difficult to implement and difficult to use. The Civil Penalty Process (CPP) portion of the MISLE project is examining the CG4100 Boarding Report process with the goal of simplifying the process and the data collection.

5.2.2 Incomplete data.

A second problem relates to prefilling the CG4100 Boarding Report with useful data. In an attempt to create as complete a vessel description data base as possible, a routine was created that combined extracts from LEIS II and MSIS to make one vessel data base (see reference 4 for a more detailed description of the merge routine). The decision was made to use the MSIS vessel data as the primary source and augment it with LEIS data if a record match could be determined. In order to prevent duplicate records, new records are checked against already created records to test for a match. Record matching is affected by two issues: 1) the match algorithm, which requires certain fields to match, and for matches to be exact; 2) the variability of data in the LEIS II data base, particularly in the fields being matched. Incomplete records, or records which did not meet expected data formats exactly were rejected. Also rejected were records that were inconsistent with

records already within the data base (e.g. if the document number matched, but the vessel name did not). Due to the disparity between MSIS and LEIS II and the inherent design of LEIS II, it was not possible, with the time and budget provided, to incorporate operator information from LEIS II into the vessel description of the merged data base. This resulted in those fields being empty more often than not when an operator queried the system. This problem supports the findings in Section 2.6.2 of the OA&TP (reference 1).

The operator was also concerned with privacy act violations if the prefilled information was incorrect when they went aboard the vessel. The SOP was to line it out and write in the correct information; however, this would potentially leave personal information visible on the report being left with the vessel master.

5.3 Communications Problems

Section 2.5 of the OA&TP (reference 1) addresses shortfalls in communications capabilities. OIS+ was not immune to some of the contributing reasons identified for why the Coast Guard can not communicate effectively. Specifically the OA&TP identified the lack of reliable connectivity, the communication capacity and functionality problems, and the labor-intensive interfaces as causes for ineffective communications. In spite of a concerted effort to avoid these pitfalls, OIS+ fell subject to them just the same. This section will describe the communications methods chosen and why, what problems were experienced and what efforts were made to overcome these problems.

From its inception, OIS has never been about communications. The assumption has always been made that an acceptable communications path will be available whenever OIS is ready to go into the field. In the mean time, the project planned to use whatever was available. This assumption was made for OIS+ as well. Even though several available communication methods were considered prior to selection, communication problems were still encountered. The rest of this section describes in detail the specific communication problems encountered during OIS+. Prior to proceeding with any future work in the OIS arena, an acceptable communications path needs to be available. Also certain design features were chosen (e.g. web based technology) to keep OIS+ as flexible as possible in the area of communications. OIS+ demonstrated this flexibility with operators accessing OIS+ via cellular modems, landline modems, CGDN+ and to a limited degree, commercial satellite communications (SATCOM).

5.3.1 Circuit switched cellular.

The technology chosen for the mobile platforms operating in this prototype was circuit switched cellular (CSC) communications. This is the same technology used by non-digital cell phones. Other technologies considered included CDPD, RAM, ARDIS and commercial SATCOM. CSC was selected because it provided the best coverage in the prototype area and it was the least expensive to implement. This is not to say the other technologies should be permanently ruled out or that others should not be considered. Given a different geographic location and or a different platform, another one or a combination of these technologies may be better suited. The important thing to remember is to keep the application flexible enough to work with various modes of

communications and to continue to evaluate alternate communication paths. Section 12.3 of the OA&TP (reference 1) discusses some of the efforts that are currently underway within the Coast Guard to resolve the communication shortfalls.

5.3.2 Dial-up Networking Problems.

While CSC was selected because it provided the best coverage in the prototype area, the solution was still problematic. The problems related to two different issues. The first is that using CSC required using the Dial-up Networking features incorporated into the Microsoft® Windows products. Even with efforts to automate and script as much as possible, the dial-up networking interface is fairly labor-intensive and requires the operator to have a basic level of understanding in dial-up networking. This is the same technology used to connect to an internet service provider (ISP) from home, however, most of the operators were not familiar with this process. Even after the operator got past the mechanics of initiating a dial-up network connection, the connection would not always go through the first time, and the error messages provided by Windows are often cryptic and of no help. Even if the connection did go through on the first time, due to the nature of the cellular technology, it takes about 50 seconds from the time the computer dials the phone number to the time a connection is made which allows the browser to work properly. This is a long time to wait if you're trying to get some information on a vessel you are currently intercepting. Some of the digital mobile communication products, like CDPD, do not require an interface to the dial-up networking in order to connect. They usually have a one-time daily registration process that then allows the operator to communication on the network for the rest of the day (as long as the operator remains within the coverage area).

The second problem related to the use of CSC is that while the offshore coverage was better than any of the other options, it was still not robust enough. In order to make the cellular communications as reliable as possible two parameters needed to be configured. First, the modem speed needed to be limited to 4800 baud. Any attempts to communicate at higher speeds jeopardized reliability. Second, the cellular modems used an error correction protocol called Enhanced Throughput Cellular (ETC). This protocol was specifically designed to handle cellular problems such as signal fading, packet delivery delays and transferring from cell to cell. To get the most benefit from the ETC protocol requires having an ETC capable modem on the shore side to dial into. Once this was discovered and the appropriate modems were installed, the ability to maintain a cellular call, once established, greatly improved.

The commercial cellular network is optimized for coverage of the I-95 corridor. Even with all of the parameters and settings optimized for cellular communications, the problem of establishing a cellular call still remained. Factors such as the time of day, the number of cellular users in the area, or some other factor beyond Coast Guard control, often times resulted in the operator having to attempt a connection multiple times (as many as 10 times) before the call would go through. Nothing under the control of the operator would change, but one time the call would not go through, the next time it would. The best that could be determined is that the cellular network was temporarily

busy and that persistence finally paid off. This does not qualify as a reliable connection or a user-friendly interface as required in the OA&TP.

5.4 MAR Part II Benefits of OIS+

The MAR Part II identified eight potential benefits that could be derived from a system like OIS+. Many of the benefits have already been discussed throughout this report. The information will be presented here for continuity and context. The data for this section were received during the second user workshop as well as from the Qualitative Assessment (QA) forms and certain automatic measures built into OIS+. To provide a base line to compare OIS+ against, data collection cards were distributed to the testbed stations. These cards were designed to measure the amount of time an underway unit spent conducting individual sightings and boardings. The stations were asked to complete these cards during the few months OIS+ was being developed. The measures data and a sample card with the instructions provided are enclosed in Appendix 1.

5.4.1 Reduced Data Entry Costs.

OIS+ got mixed results for this measure. Sightings did well. Boardings did not. The process of entering sightings definitely saved data entry costs. All three measures support this finding. During the user workshop the ability to capture a sighting just once and then not have to worry about it again was highly praised. The average evaluation mark given on the Qualitative Assessment form for submitting sightings and boardings was a 2.30 which equates to being rated as "Somewhat Useful." The comments provided on these forms indicate that had there been a category to rate just sighting submissions that would have been rated closer to being "Very Useful." The built-in measures also support this case. At first glance, it appears that OIS+ only reduces the amount of time it takes to capture a sighting by approximately 15 seconds. However, the measures are a bit mis-leading. The data collection cards only captured the amount of time it took to approach a vessel and record all necessary data (i.e. vessel description, position, date and time). It did not capture the amount of time spent upon return to the station to enter the sighting into LEIS II. The built-in measures of OIS+ include that data entry time. So if the data entry time were to be added to the Pre-OIS sighting time, the times saving would be more significant.

The data entry costs for entering Boardings did not fair so well. As discussed in section 5.2, the process was complex due to the quantity of data that is required to be captured for a boarding. The complexity of capturing the data also contributed to the complexity of the code. There were also a few bugs with this module. Some of them were fixed fairly quickly, once properly identified. Others were beyond the project control (like the specific format required for the DATE entry). Work-arounds were developed for these situations. However, if the operator forgot about it or was unable to keep track, he or she would often times run into problems entering the data and would have to attempt entry multiple times or call for assistance. This was made very clear during the workshop and from the comments on the QA form. The built-in measures can not be used in this case. The data collection cards (the baseline) measured the actual time a Boarding Party spent conducting a boarding. The goal was to see if prefilling a CG4100 would reduce the

boarding time. However, due to problems encountered with this particular module of OIS+, the operators adapted the way they used OIS+ to capture boardings. The vast majority of the boardings entered into OIS+ were entered entirely after the fact, from the shore stations computer. So the built-in measures of OIS+ captured the amount of time it takes to enter a boarding into OIS+, not the actual amount of time it took to conduct the boarding. Therefore, these two numbers can not be compared. To do so would be meaningless. However, if LEIS II has some statistics for how long it takes to enter a boarding into LEIS II, than that number could be compared against the built-in measures captured by OIS+.

5.4.2 Improved Accuracy.

This benefit was not measured directly. However, it can be implied that certain systematic features would inherently improve the accuracy of the data. The fact that a query to the data base for a certain document number or state registration number will always provide the same vessel description information implies that all the sightings for that vessel will be consistent. Integrating the UTB's GPS into the web browser allows the operator to capture the latitude and longitude without fear of transposing two numbers. The fact that sightings are captured electronically once, at the time of the sighting, and are captured by the person actually conducting the sighting, not a watchstander who gets handed a bunch of scribbled notes two hours after the fact, has to improve the accuracy of the data. The same could be said for the CG4100 Boarding report if that portion of the application had worked better while underway.

5.4.3 Timeliness of Information.

This benefit actually has two sides to it. The timeliness to submit information and the timeliness to retrieve information. Both facets performed well. The timeliness of submitting the sightings and boardings scored well on the QA forms. As mentioned above the average evaluation mark given on the Qualitative Assessment form for submitting sightings and boardings was a 2.30 which equates to being rated as "Somewhat Useful". This score was supported by the comments on the QA form as well as at the user workshop.

The timeliness of retrieving previous sighting and boarding information scored very well. The average evaluation mark given on the Qualitative Assessment form for retrieving vessel information prior to a sighting or boarding was a 1.84 which equates to being rated as "Very Useful". Again, this score was supported by the comments on the QA form as well as at the user workshop. In fact, this was identified as one of the features that will be the most missed when the OIS+ evaluation concluded.

5.4.4 Reduced distractions/workload during operational missions (operating unit/command center).

This benefit (and the following two benefits) was never fully realized during the prototype. The potential was there to reduce distractions by having the necessary information (previous sighting and boarding info as well as current lookout list information) presented to the operator in one place when the operator asked for it. The benefit was never fully realized because of the difficulty encountered with establishing

communications, as discussed in section 5.3. However, there were enough successful connections to test this concept and determine that with improved communications this benefit could be fully realized.

Another factor that added a distraction was the learning curve required to operate a Windows® laptop computer. At the beginning of the prototype, only one station had migrated to SWIII. The majority of the operators were not comfortable with using a Windows® computer. All they knew was the SWII BTOS computers. This gradually changed over the course of the prototype as the stations were migrated to SWIII. As they became more comfortable using the SWIII, operating the computer on the boat became less of a distraction.

5.4.5 Better distress coverage by eliminating saturation of voice channels with C^2 traffic.

This benefit was not measured directly. However, it can be implied that certain systematic features would inherently reduce traffic on the voice channels. Specifically, providing the UTB with a target vessel's description and history via the computer eliminates the need for the operator to call back to the station over a voice channel to obtain this information. It was noted during the user workshop that the email capability between the UTB and the station did come in useful for requesting and replying to personnel NCIC checks. Like the benefit above, this benefit was never fully realized because of the difficulty encountered with establishing communications, as discussed in section 5.3. However, there were enough successful connections to test this concept and determine that with improved communications this benefit could be fully realized.

5.4.6 Improved capacity to respond to emergency cases.

This is another implied benefit that can be derived from the benefits listed in sections 5.4.1, 5.4.4 and 5.4.5. If the operator is spending less time entering data into a computer, is less distracted because the information he or she needs is provided when requested and the voice channels are available to broadcast the emergency case, then he is more likely to be alert and better rested to respond to the emergency case when it is broadcast. There were no measures captured during this prototype that supports or lends any evidence to this benefit.

5.4.7 Improved command & control picture for operational decision making.

This benefit has two sides to it. The improved decision making on the UTB and the improved C2 decision making at the Station and the Group. The board/ no board decision, which needs to be made aboard the UTB, is aided with the information provided by OIS+. The timely retrieval of the target vessel's sighting and boarding history as well as knowing whether or not the vessel is on the lookout list greatly aided the Boarding Officer with the decision to board or not. Plus the Coast Guard's image is greatly improved by not having to ask the vessel's master "when was the last time you were boarded by the Coast Guard?" and "what color form did the Boarding Officer leave aboard?"

The stations and/or the Groups C2 picture is also enhanced with OIS+. Every sighting and boarding submitted in OIS+ is automatically and almost immediately available for

display on a C2PC plot. The UTB's position is also plotted. This consolidated plot can be used by the stations and groups to determine where operations have been concentrating, what areas may have been neglected, or for any other type of strategic planning. Also knowing where the UTB's are currently operating provides the ability to better coordinate operations on or around Group/District borders. A Station CO said with the use of C2PC he "could quickly determine the boats position and make deployment decisions without having to use voice radio".

5.4.8 Better and more consistent data recording for performance measuring.

This is an inherent benefit derived from all of the above-described benefits. If the operator is required to enter less data and the entry of that data is made easier, then there are bound to be less errors or inconsistencies in the data. Also, if the operator knows that the information is serving a useful and timely purpose and is not just being captured for statistical purposes, he or she will be more likely to enter all of the information available, vice, just the minimum required.

6 Recommendations

6.1 General Coast Guard Information Technology Improvements

The findings of this prototype support the recommendations of the OA&TP (ref. 1) and are consistent with the findings of the R&D OIS Phase I & II proof-of-concept projects (ref. 2 & 3). Specifically, those findings are that an OIS is needed and will work to:

- reduce redundant data entry,
- improve command and control and
- provide the right information to the right people at the right time.
-

However, this prototype brings to light some necessary changes within the Coast Guard infrastructure before an OIS is operationally feasible. This prototype made these changes more evident than the previous proof-of-concept projects. That is because the proof-of-concept projects were long term projects trying to "guess" where the Coast Guard was headed in reference to information technology (IT). This prototype was designed to use existing or planned "near term" Coast Guard information technology. This focus on the "here and now" highlights the need for the changes within the Coast Guard infrastructure before an OIS is operationally feasible. The following sections describe in detail the recommended improvements. Some of the recommendations are already in progress, in one form or another. The purpose for reiterating these efforts here is to lend them support and emphasize the importance of seeing these projects through to completion. It is important to note that the time to implement a fully featured Coast Guard-wide OIS is not until after most of these major improvements are complete. Any attempt to do so otherwise will either duplicate these efforts; result in an application which the users want but which the Coast Guard IT can not yet support; or both.

6.1.1 Improve the back end data systems.

To provide the operator with the very best information available, a significant amount of effort was expended to create as complete a vessel description data base as possible. This data base was a combination of extracts from LEIS II and MSIS. This undertaking was necessary because each data base contained information about a vessel that was not available in the other data base. However, as shown below (Figure 21), the Marine Information for Safety & Law Enforcement (MISLE) project is a multi-year major acquisition project, that amongst other things, will establish a Coast Guard supported vessel description data base.

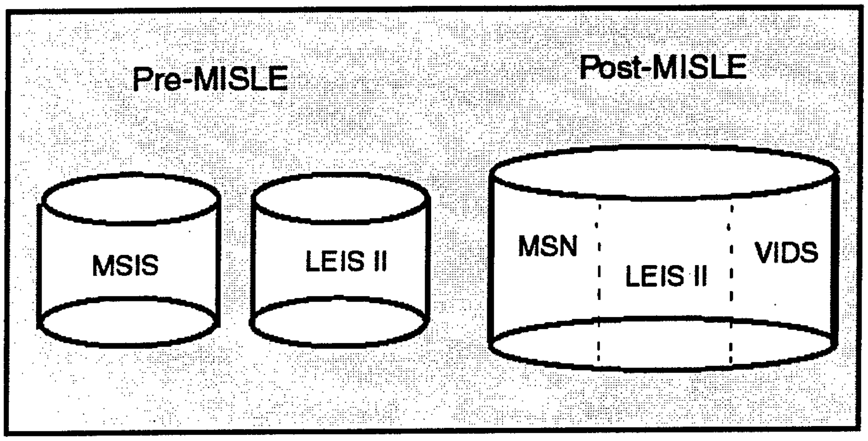

Figure 21: MISLE Concept Diagram

The following description was copied from the FY98 Five Year IT Plan: "The MISLE project will provide replacement systems for the Marine Safety Information System (MSIS) and the Law Enforcement Information System (LEIS). It will satisfy the legislative mandate of Public Law 100-700 which requires the establishment of a nationwide vessel identification system and the modernization of maritime commercial instruments and liens processing. Systems are necessary to meet the information needs and legal mandates of the Marine Safety, Environmental Protection, and Law Enforcement Programs. MSIS hardware and software are technically obsolete, increasingly difficult to maintain, and unable to support the missions of the Office of Marine Safety, Security and Environmental Protection throughout the 1990's. Vessel Identification and Documentation System (VIDS) must be developed since there are no existing systems that can satisfy the requirements of PL 100-710. The Law Enforcement Information System II (LEIS) will be integrated with the Marine Safety Network (MSN) and VIDS to provide cross-functional support to the USCG and other State and Federal law enforcement agencies."

When MISLE is operational (currently scheduled for FY02) the consolidated vessel data should be available. Then efforts can be concentrated on how to best present the data to the operator, as opposed to how to gather, consolidate and reconcile the data.

6.1.2 Improve mobile data communications infrastructure.

This is not an endorsement for or against Bell Atlantic© products or services, but to steal a quote from Bell Atlantic© "your call is only as good as the network it's on." This is definitely true in the case of mobile data communications. As discussed in section 5.3 of this report and section 2.5 of the OA&TP (ref. 1) a fast, reliable communications path that is quick and easy to establish and maintain is absolutely essential for the success of any OIS.

6.1.2.1 Different paths for different areas/different platforms.

Communications is not an area where "one size fits all." It is necessary to tailor the communications path to the regional environment. With a system like OIS+, designed to use web technology and the TCP/IP networking protocol, any number of communication paths could be utilized. As discussed in section 5.3, circuit switched cellular (CSC) was chosen for this prototype because it provided the best coverage in the geographic region. But any number of other technologies, including CDPD, digital cellular, or commercial satellite communications, could have been used if these services were available in the region. Even with CSC, three different vendors were needed to obtain coverage along the 150-mile stretch of New England coast. This flies in the face of the Coast Guard's desire to install standardized packages, especially aboard standard boats and aircraft. The Coast Guard should evaluate all the various communications options and standardize on the three or four that will best meet the needs for the vast majority of platforms and regions. These three or four choices could then be prioritized based upon availability, regional coverage and cost. This type of approach would provide the flexibility needed to engineer the best possible communications path. At the same time it provides a standard enough solution so that the system can still be supported.

6.1.2.2 Current communications projects.

The Coast Guard currently has some projects underway to evaluate and procure commercial satellite systems. The primary project is titled the "Commercial Satellite Communications Upgrade," RCP 99-300. This RCP has four components. The first component upgrades the INMARSAT terminals from A to B on the WHECs, WMECs, and WAGBs. The second component uses Commercial SATCOM to replace the High Frequency Data Link System (HFDL) on WAGBs, WPBs, WLBs. The current HFDL system provides message traffic to these platforms when they are underway. The third component uses Commercial SATCOM to provide air to ground reporting for all aircraft. The fourth component provides voice Commercial SATCOM on WTGBs and CPBs. This is a multi-year RCP sponsored by G-OCC with a target completion date of FY04.

A second project is an R&D effort titled "Mobile Communications Infrastructure," R&D Project #9250.7. This project will evaluate new and emerging commercial systems to meet Coast Guard mobile communications requirements. The project will look to develop an architecture for wide area network connectivity between mobile platforms and shore units. It will test and recommend alternatives that can be used to implement this Architecture at the minimum cost. This is a multi-year R&D project sponsored by G-SCT with a target completion date of FY03. This project began a year sooner than RCP99-300 such that the R&D effort provides most of the front-end work needed to complete components 2 through 4 of RCP99-300.

Both of these projects are a good start in the direction the Coast Guard needs to be heading. But there are two major gaps not being covered by either of these projects. The first major gap is in the small boat community. These boats are the Coast Guard's workhorse. OIS Phase I and OIS+ both demonstrated the benefits of providing data

communications to small boats. Neither of the above projects address providing this capability to these resources. If the Coast Guard really wants to maximize the benefits of an OIS, these resources need to have a data communications path. To limit data communications to WPBs (110s) and larger will severely limit the benefits which could be gained from an OIS.

The second major gap is related to the first. The focus for data communications seems to be on commercial satellite systems. This makes sense when you consider the area of responsibility for the cutter fleet. However, once you focus in on the small boat community, the possibility of using terrestrial communication systems may become feasible. As discussed in section 6.1.2, any number of other technologies could be used if the services were available in the region. The major wireless telephone companies are investing a lot of time and money developing and improving their digital cellular technologies. I recommend that a project be started to evaluate new and emerging commercial **terrestrial** systems that may meet Coast Guard mobile communications requirements. These terrestrial systems may offer a less expensive alternative to commercial satellite communications for the small boat and coastal zone community. Both of these gaps are possibly being addressed by the NDRS Modernization project.

6.1.3 Offline capabilities.

Regardless of how well the communications path is engineered, there are bound to be times when it fails. This is inevitable. The cause could be a hardware failure on the platform or off, extreme weather conditions, system maintenance or upgrade, or any other number of unforeseeable causes. This is why it is important to provide some level of offline operability. Once an OIS is operationally fielded, the operators will become accustomed to having it available to assist in the performance of the mission. It is not acceptable to say the boarding could not be conducted or the search pattern could not be executed because the communications link was down. A minimal set of critical functionality needs to be identified as the OIS is initially designed and then enhanced. The system needs to be designed to provide the operator with this minimal functionality regardless of the presence of a communications path. This offline functionality needs to be part of the primary design consideration and not considered as an afterthought. This was a lesson learned with OIS+. Providing offline functionality was continually deferred to address other "more critical" problems. As a result, the offline functionality was only partially implemented due to the expiration of time and money.

6.2 Future OIS+ Enhancement Recommendations

As previously noted in this report, the scope of this prototype was intentionally limited to allow for the development and implementation to occur within the time and budget provided. As a result certain features, some of which were previously available to the operator in LEIS II, were not made available in OIS+. The operators expressed strong concerns that these features need to be present in a production version OIS. These concerns were presented at the initial user workshop, reiterated individually throughout the course of the prototype and reinforced at the final user workshop. A summarized list of these features is presented here.

6.2.1 Online, intelligent job aids.

The production version of OIS should include built in job aids. Such items like Jonathan's Publication, the Boarding Officer's Job Aid Kit (BOJAK), and local district policy should be available electronically for the operator to access on demand. The operator should be able to access the job aids either in their entirety or in reference to their specific case. This is what is meant by intelligent job aids. For example, if the operator already indicated that the type of vessel being boarded is a 34' sailing vessel with three (3) adults on board, then when the operator accesses the BOJAK, the carriage requirements for a 34' sailboat should be presented. The rest of the BOJAK should be available in case the operator wants to look up other information, but the most pertinent information should be presented first.

With a web centric design such as OIS+, the master copy of the job aids could be maintained on the central web server. Local copies could be stored on the platform's computer to minimize network traffic and decrease response time. Then only when the central version was updated would it be necessary to download the revised version to the platform's computer.

6.2.2 Case package support.

The production version of OIS should include support for the preparation of standard law enforcement case package documents. The system should provide templates for such documents as Field Intelligence Reports (FIR), Enforcement Action Reports (EAR) and Offense Investigation Reports (OIR). These templates should be prefilled with information that has already been captured, and there should be the ability to cut and paste to and from these templates.

As with the job aids, the master copy of the templates could be maintained on the central web server. Local copies could be stored on the platform's computer to minimize network traffic and decrease response time. Then only when the central version was updated would it be necessary to download the revised version to the platform's computer.

6.2.3 Real time personnel checks.

The production version of OIS should allow the mobile operator to conduct real time NCIC and local wants & warrants checks of subject personnel. Operators who were also Boarding Officers felt very strongly about the need for this feature. Some of this capability is currently provided by LEIS II but only from the shore units. The addition of this feature would greatly enhance the safety of the boarding team.

6.2.4 Links with other federal agencies.

The production version of OIS should have links with other federal agencies to gain access to information such as NMFS permits, vessels registered in the VMS program, Days at Sea number assignments, etc. These links would help complete the entire informational picture allowing for better law enforcement and would enhance the Coast Guard's image as an agency in the know.

6.3 *Recommended Changes to LEIS II NT.*

During the final user workshop the operators identified the features of OIS+ that provided them the most benefit (detailed in section 5.1). Among these were:

- The one time submission of sighting reports
- The ability to retrieve the recent history of the vessel (lookout list, last sighted, last boarded)
-

It became clear during the final user workshop that a modified version of the LEIS II NT client could provide these beneficial features.

It needs to be noted that the rest of this section is a theoretical discussion. This concept was only developed after it was introduced at the final user workshop. Since then the project researched the LEIS NT configuration and the data base replication process, but was not able to actually test this theory. The recommendation is to pursue this endeavor only after LEIS NT has been successfully beta tested if not completely fielded.

The LEIS NT client, currently in a beta version is configured as illustrated in Figure 22.

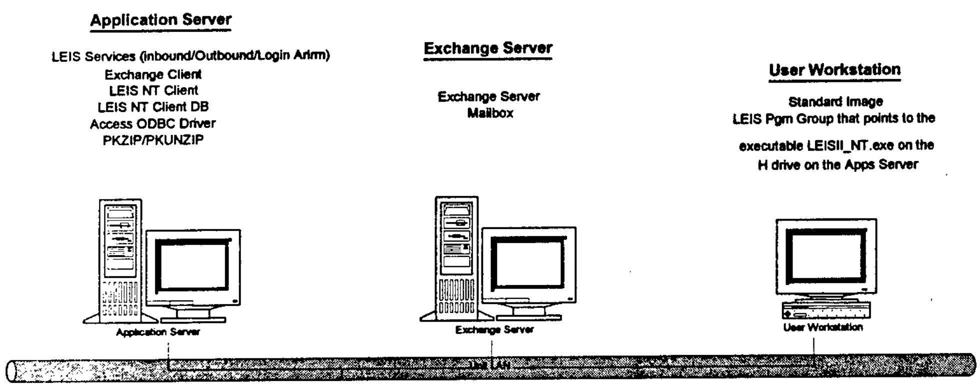

Figure 22: LEIS NT Client Configuration

As originally designed the LEIS NT client resides on the unit's application server. An operator accesses LEIS from his SWIII computer. If the operator is performing a query of LEIS, say for the date a vessel was last boarded, the application would transmit the query across the CGDN+ to the LEIS Central computer at OSC, Martinsburg, WV. LEIS Central retrieves the requested information and sends it back to the operator. No data is stored on the application server. If the operator is entering a Sighting or Boarding Report (SABR), the information is entered from the SWIII workstation and saved in the LEIS NT client data base. When the operator indicates that all the information is complete and ready to be transmitted to LEIS Central, the client application packages the SABR into an e-mail and uses the exchange client to email the SABR to LEIS Central. For shore based units, the LEIS NT client data base is typically just a holding place for SABRs in progress. For cutters, the LEIS NT client data base is frequently populated with a subset of the LEIS Central data base. For example, the LEIS NT client data base could be

populated with all vessels sighted or boarding in the D1 area of responsibility over the last 90 days. This would then become the data base queried by operators aboard cutters unless they dialed into LEIS Central via INMARSAT.

The suggestion is to modify the LEIS NT application as illustrated in Figure 23.

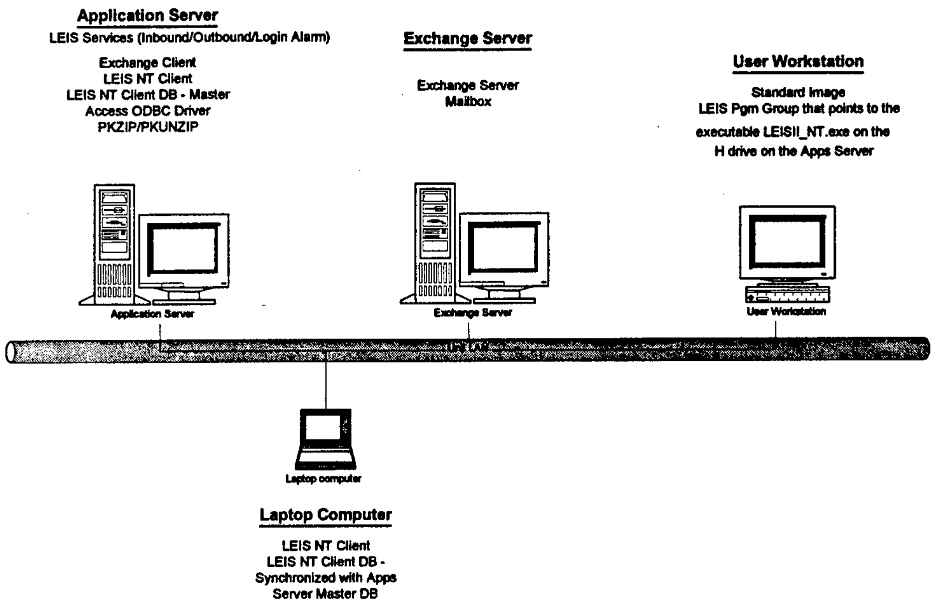

Figure 23: Modified LEIS NT Client Configuration

The software on the Exchange Server and the SWIII workstation remains unchanged. The software on the Application Server is essentially the same with one exception. The LEIS NT client data base has been designated a MASTER data base. The reason for this will become clear below. The laptop computer is configured with the LEIS NT client software as well as a copy of the LEIS NT client data base. However, this data base is designated as a replicated data base. The master data base on the application server would keep itself populated with as current an extract of the LEIS Central data base as possible. Possibly updating itself 3 or 4 times per day. When the laptop is plugged into the unit LAN, through the process of data base replication, it gets the most recent version of the LEIS NT client data base, which is on the application server. The laptop is then unplugged from the LAN and taken underway aboard the small boat. The replicated data base is queried underway for lookout list, last sighted and last boarded information. In the worst case at the end of a 4-hour patrol, the information is up to 10 hours old. This would only be if the laptop replicated with the application server just before the application server requeried LEIS Central. The replicated data base is also used to capture any sightings conducted by the small boat during the patrol. When the small boat returns to the station, the operator plugs the laptop back into the unit LAN and synchronizes the data bases again. As before, the laptop will get an updated extract of the LEIS data base. However, this time, all the captured sightings will be transferred to the master LEIS NT client data base on the application server. From there they can be sent to LEIS Central as usual.

6.4 *Basic Computer Training Required.*

At the commencement of this project (FEB 1998) only one of the seven stations participating in the prototype had been migrated to SWIII. During the course of the project the remaining six stations were eventually migrated. All the participants were very cooperative, some were even eager to be part of something new. However, the vast majority of the operators were not very computer literate. Most of the personnel were comfortable using the SWII computer. However, very few were even partially familiar with how to navigate within a Windows® computer. As would be expected, as the units migrated to SWIII, the operators comfort level and ability to use a Windows® computer increased. But this is because they were receiving training and had "resident experts" to consult.

The purpose for this section is to negate the perception that the personnel entering the Coast Guard today have grown up around computers and are therefore computer literate. This project did not find this to be the case. There are a few exceptions, but for the majority, basic computer training is still necessary. This project also found that keyboarding/typing skills need to be taught, even to personnel who are computer literate. The Joint Rating Review (JRR) recommends that all rates require "a core set of technology understanding." This recommendation illustrates the point that the use of a computer is becoming a standard part of all Coast Guard personnel's every day job regardless of rate or rank. Basic computer and keyboarding skills should be taught at all Coast Guard accession points officer and enlisted alike.

Specifically, the training should address such things as:

- how to properly turn on and off a computer
- how to navigate around the desktop (various shortcuts, minimize, maximize, ALT-TAB, etc)
- an explanation of the file system. How to move/copy/delete files/directories etc.
- an indoctrination of the standard applications (Word and Outlook as a minimum).
- basic keyboarding (typing) skills. The goal is to reduce the two finger hunt and peck typing.

Realizing that some people may not need all of the above training, some sort of 'testing out' process needs to be developed. This would ensure that personnel were only getting the training required. It would also provide a measure as to whether or not the training is still required. If after a few years the majority of personnel entering the Coast Guard test out of all the training, then we know the training is no longer necessary.

This core level of training, provided at the accession points, would ease the burden of training personnel in the use of mission essential applications (MEAs). The MEA training could concentrate on the details of the specific program, knowing that every user has a "core set of technology understanding."

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1. USCG C4I Objective Architecture and Transition Plan, Enclosure (1) to COMDTINST 3090.7, U.S. Coast Guard Headquarters, Washington, DC, 24 November 1998.

2. OIS I Evaluation Report, U.S. Coast Guard Research and Development Center, Groton, CT, February 1995.

3. OIS II Evaluation Report, U.S. Coast Guard Research and Development Center, Groton, CT, April 18, 1997.

4. OIS+ Prototype Development CSDD, U.S. Coast Guard Research and Development Center, Groton, CT, 31 March 1999.

5. Command & Control PC (C2PC) Version 5.1.0.0 Users Guide, USCG Commanding and Control Engineering Center, Portsmouth, VA, 1 June 1998.

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- OIS+ Resource and Target Tracking Client and Server CSDD, USCG Research and Development Center, Groton, CT, 25 January 1999.

- OIS MAR Part 1, Commandant G-OCC, USCG Headquarters, Washington, DC.

- OIS MAR Part 2, Commandant G-OCC, USCG Headquarters, Washington, DC, September 30, 1997.

- Ruggedized Notebook Standard Memo from Commandant (G-OCC), USCG Headquarters, Washington, DC.

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Appendix 1 Measures Data

The statistics presented in this appendix are based upon data captured during the use of OIS+.

Summary Sighting Count

# of Sightings	*Unit*	*OPFAC*
369	STATION GLOUCESTER	01-30136
182	STA S. PORTLAND	01-30129
62	STATION PORTSMOUTH HARBOR	01-30160
30	STA PT ALLERTON	01-30154
6	STATION BOOTHBAY HARBOR	01-30606

649 ***Total***

Average time per sighting with OIS+: 3.51 ***minutes****

Average time per sighting prior to OIS+: 3.77 ***minutes*****

* This number is based upon measures built into the OIS+ data base. The timing commenced when the operator enters the Sighting Report screen (either with or without prefilled data) and ends when the operator presses the submit button.

** This number is based upon measures captured using the data collect cards. A total of 105 sightings were recorded using the data collection cards. The data collection cards only captured the amount of time it took to approach a vessel and record all necessary data (i.e. vessel description, position, date and time). It did not capture the amount of time spent upon return to the station to enter the sighting into LEIS II. The built-in measures of OIS+ include that data entry time.

Summary Boarding Count

# of Boardings	*Unit*	*OPFAC*
101	STATION GLOUCESTER	01-30136
76	STA S. PORTLAND	01-30129
44	STATION PORTSMOUTH HARBOR	01-30160
40	STA PT ALLERTON	01-30154
1	STATION BOOTHBAY HARBOR	01-30606

262 ***Total***

Average time per boarding with OIS+: 13.23 ***minutes****

Average time per boarding prior to OIS+: 30.69 ***minutes*****

NOTE: **THESE TWO NUMBERS CAN NOT VALIDILY BE COMPARED.**

* This number is based upon measures built into the OIS+ data base. The timing commenced when the operator enters the Boarding Report screen (either with or without prefilled data) and ends when the operator presses the submit button. **NOTE**: the vast majority of these boardings were entered after the fact. That is, they were entered from the Station after the boarding was complete. This time reflects data entry time.

** This number is based upon measures captured using the data collection cards. A total of 40 boardings were recorded using the data collection cards. The data collection card measured the actual time it took the boarding team to conduct the boarding on the vessel. NOT the data entry time. This is why the two numbers cannot be compared. At the commencement of this project, it was theorized that the prefilled CG4100 Boarding Report would reduce the actual boarding time spent aboard subject vessel. However, during the execution of the prototype, this theory was not tested due to communication and printing problems. The built-in measures ended up only capturing data entry time because of the method in which the operators used OIS+ for boardings.

Sample Data Collection Card

Coast Guard Unit Information

OPFAC Number:	01 - 30136
Boarding Officer Init.:	
Platform:	
Date:	/ / 1998

Boarding/Sighting Information

Case/Sighting ID # 1998

Vessel Type:	Contact Type:	SNO?
☐ Recreational	☐ Sight	☐ Yes
☐ Fishing Vessel	☐ Pre-board	☐ No
☐ Commercial - Other	☐ Board	

Process Measures

	Start	Complete
Sighting	:	:
Boarding	:	:
Ext. Agency/Person Chk.	:	:

Case Preparation	Total Time:	:
Offline Case Preparation	Total Time:	:

OIS+: Not Installed

Sighting Start: When record first item of information.
Sighting End: When board/no board decision is made.
Boarding Start: When board decision is made.
Boarding End: When Boarding Team returns to the platform
Ext Agency/Person Chk Start: When original request is submitted to shore.
Ext Agency/Person Chk End: When results are recieved from shore.
Case Preparation includes BO processing time from boarding end to submission to LEPO.
Offline Case Preparation: LEIS II data entry time.

Use the reverse side of this card to record any comments, specific issues unique to this sighting or boarding, or any problems encountered.

OIS+ Measures Data Collection Card Instructions

- Complete one card for every vessel sighted or boarded.
- Carry a supply of cards on each platform that conducts sightings and/or boardings (not just UTBs).

Coast Guard Unit Information

- **Boarding Officer Init**: The person completing the card. This is just incase there is a need to follow up on the information captured on the card.
- **Platform**: Identify which Coast Guard platform is being used to perform the sighting or boarding (i.e. UTB, RHI, Pierside, auxiliary, etc)
- **Date**: Write in the date the card is being filled in.

Boarding/Sighting Information

- **Case/Sighting ID #**: Write in the Unit assigned Boarding Number
- **Vessel Type**: Check off the appropriate type vessel that is being sighted or boarded.
- **Contact Type**: Check off whether it is a sighting, a Pre-board with a decision not to board, or a boarding.
- **SNO?** Indicate whether or not the boarding required the receipt of an SNO.

Process Measures

- **Sighting Start**: This is the time when someone on the UTB first records some information about the vessel of interest. *This will correspond to the initial query of OIS+.*
- **Sighting Complete**: This is the time when the decision is made on the UTB to either board or not to board the vessel of interest. This will correspond to the submission of the sighting to the web server via OIS+.
- **Boarding Start**: This is the time when the decision is made on the UTB to board the vessel of interest. This is the same time that would have been entered in Sighting Complete. *This will correspond to the selection in the Web Browser to pre-fill the CG-4100 Boarding Report using the OIS+ system.*
- **Boarding Complete**: This is the time when the Boarding Team has returned to the Coast Guard Platform. *This will correspond to selection of the Boarding Complete action using the OIS+ system.*
- **Ext Agency/Person Chk Start**: This is the time which the boat crew starts to radio back to the Group or Station requesting a personnel check. *This will correspond to the text message the boat crew will send back to the Station with a typed list of personnel data to be checked.*
- **Ext Agency/Person Chk Complete**: This is the time the Group or Station radios back with the results from your request. *This will correspond to receipt by the UTB of an e-mail response from the Station containing pertinent personnel data.*
- **Case Preparation**: This is the total amount of time it takes for the Boarding Officer to prepare the CG-4100 Case package for submission to the LEPO for review. If additional time was required for statement preparation, include this in the table and indicate the approximate time it took to prepare the statements on the back of the card. *This will correspond with the amount of time it takes to enter the CG-4100 info into OIS+ upon completion of the Boarding.*
- **Offline Case Preparation**: This is the total amount of time it took to enter the sighting or boarding into LEIS II via the Standard Workstation II. *OIS+ will totally eliminate this requirement.*

Reverse side of the card

- This area is your chance to communicate with the OIS+ Development Team. Use this area to indicate anything that might have been unusual about this specific sighting or boarding. Reasons why it went unusually quick or long.

Quality Assessment Averages

Based Upon **20** Quality Assessment forms submitted by various OIS+ users during the course of the prototype the following average statistics have been generated.

The first group of criteria relates to the station's effectiveness since the introduction of OIS+.

The scale equates as follows:

1: Significant Decrease
2: Some Decrease
3: About the Same
4: Some Increase
5: Significant Increase

How did OIS+ effect the amount of time it took at your station for Case Package Preparation?	2.94
How did OIS+ effect the amount of time devoted to reviewing/approving sighting or boarding reports?	3.32
How did OIS+ effect the overall quality of sighting & boarding reports issued from your station?	3.12

The second group of criteria relates to the usefulness of certain OIS+ features.

The scale equates as follows:

1: Very Useful
2: Somewhat Useful
3: Neither Useful or Burdensome
4: Somewhat Burdensome
5: Very Burdensome

Connecting to OIS+ using the cell phone	3.82
Retrieving vessel information prior to a sighting or boarding	1.84
Submitting sightings and boardings to OIS+	2.30
Saving & subsequently submitting sightings & boardings using OIS+ offline capabilities	2.68

Appendix 2 Hardware Selection & Specification

2.1 Rugged Laptop Computer

Due to the rugged, salty, wet environment of a 41' UTB as well as the serious budget and time constraints of this project, an informal, non-scientific comparison of several rugged laptops was conducted prior to selection. This comparison was performed in conjunction with G-OCC's efforts to identify one or two standard rugged computers for use throughout the Coast Guard (reference 7). Three rugged laptops were considered for use in this project, the Fieldworks computer which was being used in the ATON program; the Panasonic CF-25 computer, which was being used in the Aviation program; and the Itronix XC-6250 computer. Due to some reported problems being encountered at the time with the Fieldwork computers, and the fact that the Coast Guard had experience with these computers in the ATON program I choose not to consider them further for this project. That left the Panasonic CF-25 and the Itronix XC-6250 for consideration. Both computers are available on GSA contract. After comparing the market literature, considering form factor and various available features and after conducting a side by side comparison of the two units, I decided the XC-6250 best meet the requirements of this project and would hold up the best in the demanding environment of the UTB.

The Itronix XC-6250 rugged laptop computer as used in this prototype was configured as follows:

- 133 Mhz Pentium® Base Unit,
- 10.4" Color Touch Screen,
- 32 MB RAM Memory,
- PCMCIA Type II & Type III slots,
- 1.6 GB Shock-Mounted Hard Drive, 3
- 3. 6K Modem,

all enclosed in a fully environmentally sealed, intrinsically safe, die-cast magnesium case encased with Santoprene® for additional shock absorption. The computers were loaded with Windows 95 with the Pen add-ons. The lack of an installed floppy drive provided additional security in that it kept the end users from easily installed non-standard software. For current product information see Itronix's web site http://www.itronix.com or Arbor System's web site http://www.arborsys.com.

2.2 Cellular Modem

The cellular modem chosen for this project was the Sierra Wireless MP-210. While the MP-210 is capable of operating in the CDPD mode, due to limited CDPD coverage in the AOR, I decided to use the modems in an analog, circuit switched mode. Analog cellular technology was chosen over digital solutions due to the limited implementation and coverage areas of the digital networks. See the discussion in Section 7 of this report for other communication options. For current product information see Sierra Wireless' web site http://www.sierrawireless.com.

The MP-210 has the following Technical Specifications:

Dimensions (inches): 7.25L x 7W x 2.25H
Power Supplies:
Standard 13.8V vehicle battery
RF Output:
Class 1 mobile device for AMPS and CDPD operation
Up to 3 watts power output from device (Higher ERP depending on antenna & cabling)
Antenna Interface:
50 ohm RF connector
Host Interface:
DB-9 with RS-232 signal levels with speeds up to 57.6kbps
Standard Modem/Host Software Interface:
AT command set (Circuit Switch)
SLIP (CDPD)
Transmitter Disable:
CDPD Transmitter may be selectively disabled to prevent transmission in sensitive areas
Data Protocols:
CDPD Release 1.1
Optional Circuit Switched Fax Compatibility:
CCITT V.17 14.4kbps fax
CCITT Group III Class 1 Fax
Optional Circuit Switched data communications:
CCITT V.42
CCITT V.42bis
CCITT V.32bis
CCITT V.22bis
Enhanced Throughput Cellular (ETC) Protocol
Environmental Limits:
Operating Temperature
-22F (-30C) to 158F (+70C)
(CDPD Mode, restricted duty cycle)
-22F (-30C) to 140F (+60C)
(CDPD Mode, unrestricted duty cycle)
-22F (-30C) to 140F (+60C)
(AMPS Mode option, restricted duty cycle)
Storage Temperature
-40F (-40C) to 176F (+80C)
Vibration MIL-STD 202F
Humidity 5 to 95% non-condensing

2.3 *Rugged Printer*

The rugged printer chosen for this project was the Sysscan ZFP2. This printer was chosen because it is a dot matrix, impact printer, making it capable of printing to multi-part, carbonless paper. Also the form factor of this printer was the best available to fit in the confined spaces of an UTB. I decided not to use a thermal image or laser printer because I did not think they would work as well, or hold up as well in the humid and bouncy environment of the UTB. For more current information see Syscans web site http://www.syscan.com/indexuk.html

ZFP2 TECHNICAL SPECIFICATIONS

Size/Weight
Width: 3.5" (8.9 cm)
Depth: 14.37" (36.5 cm)
Height: 3.62" (9.2 cm)
Weight: 4.56 lb. (2.07 kg)
Power
12 volt vehicle power
110/220 VAC power
Built-in power conditioning to protect against power surges and spikes
Printing characteristics
Impact dot matrix
9 wire print head
Extra long-life ribbon cartridge (black)
3-4 million character print life
Bi-directional print with logic seeking
IBM® Proprinter® III emulation
Format
Full ASCII character set
Graphics and international languages supported
Special printing capabilities: NLQ, Bold, Italics, Underline, Subscript superscript
Draft and compressed
Double-width
10 and 12 pitch
Any combination of above
Speed
180 characters draft elite
Paper
Standard U.S. and International fanfold
Multiple copies: 5 ply plus
Paper feed: traction, friction.

Interface
RS-232 DB-25 interface for any serial device
Optional; RF or IrDA module
Up to 9600 bps serial data rate
Additional features
Effortless paper loading
Three status indicator lights:
Power, On Line, Error
Five control buttons:
On/Off, On Line, Line Feed,
Back Feed and Form Feed
Complete Kit includes
Printer
DC power cable
Data cable
Mounting plate with quick release
Manual
One extra long-life ribbon cartridge
Accessories
Vertical paper tray
Vehicule mounting bracket for printer computer including paper tray
Briefcase option
110/220 volts power supply
Environmental conditions
Operating temperature:
-20° to 158° F (-4° to 70° C)
Operating Humidity:
15% to 85% noncondensing
Storage temperature:
-40° to 180° F (-40° to 80° C)
ESD to 15KV on any exposed parts or connector
Vibration and shock tested
ESD to 15KV on any exposed parts or connector

2.4 *Standard Workstation III Computers.*

To keep the system as close as possible to Coast Guard standards, and for reasons of maintenance and support, all of the shore based computers and peripherals were purchased from the Standard Workstation III contract. The standard software image with the following modifications: C2PC Client (version 5.1) and Gateway software installed. Dial Up Networking was enabled to allow the operators to dial into the CGDN+ if the unit was not yet migrated to SWIII. To ensure that the PC would have enough computing power and storage space for C2PC the multimedia workstation was selected as the standard PC for OIS+. This configuration was upgraded with a 17" monitor to make chart viewing easier. The order was placed for Pentium 166Mhz processors but due to ongoing Coast Guard negotiations the order was shipped with Pentium 200Mhz processors.

Multimedia Workstation:

CLIN	Description
0033F	Pentium 200Mhz w/CD-ROM*
0043AAB	15" Monitor
0461EE	RJ-45 - RJ45 Patchcord
0510B	Windows NT Desktop OS
0506CC	Part 2 Fee for CLIN 0506 (MS Office Professional)
0601BB	Anti-Virus Workstation
0043BB	17" Monitor Upgrade for Basic & Multimedia W/S

* Includes keyboard, mouse, 32MB RAM, 1.6GB hard drive, NIC card, 15" monitor, integrated sound card, 12X IDE CD-ROM, speakers

Basic Laser Printer:

CLIN	Description
0100C	Basic Laser Printer * Includes 2MB Memory Expansion
0390AAB	External LAN Adapter
0270A	Uninterrupted Power Supplies (UPS) (U.S. Standard Power)
027001A	700VA (U.S. Standard Power)
027002A	Serial Cable to System

2.5 *Hardware Performance*

All of the hardware was delivered to the R&DC for initial configuration. A standard configuration image was developed and tested for both the laptop and the SWIII computers. The standard image was then copied onto all of the computers using a product called Ghost Server v5.0a. This ensured all the computers were identically configured. Of course each computer needed to be slightly modified to allow it to identify where it was installed. The standard image and the Ghost software also made it easy to rebuild the computers if that became necessary.

2.5.1 UTB equipment.

The equipment aboard the UTB includes the rugged computer, the modified cradle, the cellular modem, and the rugged printer. This equipment was installed aboard the 41' UTBs for as long as 10 months. None of the rugged computers installed aboard the UTBs failed during this prototype. Two of the computers had to have the software reloaded due to inexperienced operator intervention, but none of the computers required any hardware maintenance. None of the cellular modems had any failures.
The only problem with the modified cradle was the choice of connectors used to distribute the DC power to the cell modem and the printer. For ease of maintenance and to keep standard with inventory stocked by the supporting ESD's, plastic MOLEX© connectors were used. These connectors did not provide a connection that was tight enough to withstand the boats vibrations. This resulted in the connectors working loose, being exposed to the elements and blown fuses. Each ESD remedied problems as they occurred by either replacing the MOLEX© connector or attempting to secure it in place with heat shrink or electrical tape. There were no failures of the 24VDC/12VDC power converter or to the standard computer interface passthroughs.

The rugged printer did not work well for this application. There were no hardware failures but this is because the operators did not attempt to use the printer more than a half dozen times. Operator complaints with this printer is it was way too slow and the humid environment of the boat caused the paper to get damp which resulted in frequent paper jams.

2.5.2 SWIII equipment.

There was only one hardware related problem experienced with the SWIII computer. Unfortunately, it was a recurring problem that required reloading the standard image on 10 of the 15 fielded SWIII workstations. All of the computers experienced similar, but not exact, symptoms. However, I was unable to determine the cause or duplicate the problem in the lab. The operator would experience either a system slow down or a system lock up prompting him into thinking he needed to reboot the computer. When the computer started to reboot, it would hang indefinitely on the "blue screen". The computer would no longer be operational. Each time the computer was sent back to the R&DC. Upon examination, it was determined that the boot sector of the hard disk was corrupt and the system could not be recovered. To place the computer back into operations, the computer was booted from a floppy disk, the hard disk was reformatted and the standard image would be reloaded onto the clean disk. I was unable to determine for certain what was corrupting the boot sector.

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Appendix 3 Qualitative Assessment Form

Name:
Station:
Date:

Please provide comments on the use of OIS+ at your station or on patrol during boardings. Focus on qualitative measures of the effectiveness of the OIS+ system in your operations. Use the following rankings as a starting point for your comments.

Please rank each issue relative to the station's effectiveness or performance prior to OIS+:

	Significant Decrease	Some Decrease	About the Same	Some Increase	Significant Increase
Case package preparation time at the station at the end of each patrol.					
Time devoted to reviewing /approving sighting or boarding reports.					
Overall quality of sighting and boarding reports issued from this station.					
Other. Please Specify					

Please address the usefulness of each of the following OIS+ features:

	Very Useful	Somewhat Useful	Neither Useful or Burdensome	Somewhat Burdensome	Very Burdensome
Connecting to OIS+ using the cell phone.					
Retrieving vessel information prior to a sighting or boarding.					
Submitting sightings and boardings to OIS+					
Saving and subsequently submitting sightings and boardings using OIS+ offline capabilities.					
Other. Please Specify					

Use the following questions and space to add specific comments, examples that support the rankings above or any other data you feel is pertinent to the evaluation of OIS+

Identify the one most useful feature of OIS+

Identify the one most frustrating problem using OIS +

Other comments. Please add additional comments about OIS+ here. (If you added an issue to rank in "Other," please here indicate why you feel the issue should be included in the OIS+ evaluation.)

Use the reverse side for additional space if necessary, and check here: OVER ☐

APPENDIX 4 GLOSSARY

Term	Description
AOR	Area of Responsibility
ARDIS	A company that provides two-way, wireless data communication
BOATALT	Boat Alteration
Boarding	Activity in which law enforcement personnel are placed aboard a vessel
BOJAK	Boarding Officer's Job Aid Kit
BTOS	Burroughs Technology Operating System; the operating system for SWII
C^2	Command and Control
C^4I	Command, Control, Communication, Computers, Intelligence
C2PC	Command and Control Personal Computer
CDPD	Cellular Digital Packet Data
CG-CSDD	Coast Guard Consolidated Software Development Documentation
CGDN	Coast Guard Data Network
CG-SDDS	Coast Guard Software Development and Documentation Standard
CGSW	Coast Guard Standard Workstation
CIC	Combat Information Center
COP	Common Operating Picture
COTR	Contracting Officer's Technical Representative
CPB	Coast Guard Coastal Patrol Boat
CPP	Civil Penalty Process
CSC	Circuit Switched Cellular
CSCI	Computer Software Configuration Item
CSDD	Consolidated Software Development Document
DII COE	Defense Information Infrastructure Common Operating Environment
ESD	Electronic Support Detachment
ESU	Electronic Support Unit

Term	**Description**
ETC	Enhanced Throughput Cellular, an error correction protocol
FTP	File Transfer Protocol
FY	Fiscal Year
G-OCC	Coast Guard Office of Command and Control Architecture
G-SCT	Coast Guard Office of Communications Systems
GFI	Government Furnished Information
GPS	Global Positioning System
HFDL	High Frequency Data Link
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transport Protocol
ISP	Internet Service Provider
IST	Information Systems Technology
IT	Information Technology
JMCIS	Joint Maritime Command Information System
LANTAREA	Coast Guard Atlantic Area Office
LAT	Latitude
LAN	Local Area Netwrok
LE	Law Enforcement
LEIS	Law Enforcement Information System
LONG	Longitude
MAR	Mission Analysis Report
MISLE	Marine Information for Safety and Law Enforcement
MNS	Mission Need Statement

Term	Description
MSIS	Marine Safety Information System
MSMS	Marine Safety Management System
NCIC	National Crime Information Center
NDS	National Distress System
NMFS	National Marine Fisheries Service
OA & TP	USCG C4I Objective Architecture and Transition Plan
OIP	Operational Information Process
OIS	Operational Information System
OIS+	Operational Information System Plus
OPCEN	Operations Center
OPFAC	Operating Facility
OSC	Operations Systems Center (Martinsburg, West Virginia)
OWL	Operational Web Link
QA	Qualitative Assessment
R&D	Research and Development
R&DC	Research and Development Center
RAID	Redundant Array of Independent Disks
RAM	A company that provides two-way, wireless data communication
RAS	Remote Access Service
RCP	Resource Change Proposal
SABR	Sighting and Boarding Report
SATCOM	Satellite Communications
SDDS	Software Development and Documentation Standard
SOP	Standard Operating Procedure
Station (small)	A minimally crewed small boat station that reports to another larger station

Term	Description
SWII	Standard Workstation II, BTOS® operating system
SWIII	Standard Workstation III, Windows® NT operating system
Sighting	Activity in which law enforcement personnel record the location and identification of a vessel
TCP/IP	Transmission Control Protocol over Internet Protocol
TDBM	Tactical Data base Manager
UB	Unified Build
UTB	Coast Guard 41' Utility Boat
VDC	Volts, Direct Current
VIDS	Vessel Identification and Documentation System
VMS	Vessel Monitoring System
WAGB	Coast Guard Polar Ice Breaker
WHEC	Coast Guard High Endurance Cutter
WMEC	Coast Guard Medium Endurance Cutter
WLB	Coast Guard Sea Going Buoy Tender
WPB	Coast Guard Patrol Boat
WTGB	Coast Guard Ice Breaking Tug